# Imperial Bureau of Plant Breeding and Genetics

## Plant Breeding Abstracts

Vol. X, No. 2.

(Abstracts Nos 259—583)

School of Agriculture
Cambridge
England

1st April, 1940.

# TABLE OF CONTENTS.


| | | PAGE |
|---|---|---|
| 519 | Statistics* (Empire) | 71 |
| | (Foreign) | 85 |
| 575 | Breeding* (Empire) | 71 |
| | (Foreign) | 85 |
| 575.1 | Genetics* (Empire) | 71 |
| | (Foreign) | 88 |
| 576.1 | Origin of Species, etc. | 72 |
| 576.3 | Cytology* (Empire) | 72 |
| | (Foreign) | 90 |
| 58 | Botany* | 94 |
| 63 | Agriculture | 73 |
| 632 | Plant Diseases* | 95 |
| 633.1 | Cereals (Empire) | 73 |
| | (Foreign) | 96 |
| 633.11 | Wheat (Empire) | 74 |
| | (Foreign) | 97 |
| 633.12 | Buckwheat | 105 |
| 633.13 | Oats (Empire) | 75 |
| | (Foreign) | 106 |
| 633.14 | Rye | 108 |
| 633.15 | Maize | 109 |
| 633.16 | Barley (Empire) | 75 |
| | (Foreign) | 112 |
| 633.17 | Millets and Sorghum (Empire) | 76 |
| | (Foreign) | 113 |
| 633.18 | Rice (Empire) | 76 |
| | (Foreign) | 114 |
| 633.2 | Forage Grasses (Empire) | 76 |
| | (Foreign) | 116 |
| 633.31/37 | Leguminous Forage Plants | 119 |
| 633.4 | Roots and Tubers (Empire) | 77 |
| | (Foreign) | 121 |
| 633.5 | Fibres (Empire) | 77 |
| | (Foreign) | 125 |
| 633.6 | Sugar Plants (Empire) | 78 |
| | (Foreign) | 128 |
| 633.7 | Stimulants (Empire) | 80 |
| | (Foreign) | 129 |
| 633.8 | Aromatic Plants (Empire) | 81 |
| | (Foreign) | 132 |
| 633.85 | Oil Plants (Empire) | 81 |
| | (Foreign) | 133 |
| 633.88 | Medicinal Plants (Empire) | 82 |
| | (Foreign) | 134 |
| 633.91 | Rubber Plants (Empire) | 82 |
| | (Foreign) | 135 |
| 634 | Fruit Trees | 135 |
| 634.3 | Citrus Fruits | 138 |
| 634.5 | Nuts (Empire) | 83 |
| | (Foreign) | 139 |
| 634.6 | Palmaceous and Other Tree Fruits | 83 |
| 634.7 | Small Bush Fruits | 140 |
| 634.77 | Other Fruits | 140 |
| 634.8 | Viticulture | 141 |
| 634.9 | Forestry (Empire) | 83 |
| | (Foreign) | 142 |
| 635 | Vegetables (Empire) | 83 |
| | (Foreign) | 144 |
| | Book Reviews | 150 |
| | New Journals | 155 |


*Note.*—Initialled abstracts are written by the following:—

| | |
|---|---|
| Dr G. P. Carson | G. P. C. |
| Mr J. L. Fyfe | J. L. F. |
| Mr J. G. Hawkes | J. G. H. |
| Dr K. Mather | K. M. |

* General studies, see also individual crops.

IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS

New Publication

Joint Publication No. 3, to be published April, 1940.

THE BREEDING OF HERBAGE PLANTS IN SCANDINAVIA AND FINLAND.

A symposium of articles on herbage plant breeding in Sweden, Denmark, Norway and Finland, including details of the most recent improved strains of grasses, clovers and lucerne, and the methods used in producing them, as well as a contribution on the application of cytology to herbage plant breeding.

Contributions by: G. Nilsson-Leissner, F. Nilsson, E. Åkerberg and R. Torssell (Sweden); H.N. Frandsen (Denmark); H. Wexelsen (Norway); O. Pohjakallio (Finland).

Pages: about 100. Price: Four shillings.

---

Please forward ..... copy / copies) of the above publication to the following address:

.....

.....

.....

---

I enclose..... to the value of

.....

To the Imperial Bureau of Plant Breeding and Genetics,
School of Agriculture,
Cambridge,
ENGLAND.

.....194

Digitized by the Internet Archive
in 2025

https://archive.org/details/plant-breeding-abstracts_1940-04-01_10_2

# Plant Breeding Abstracts.

## Vol. X, No. 2.

### Part 1. Empire Section

#### STATISTICS 519

259. PAUL, W. R. C. and FERNANDO, M. 519.24:631.421:633.842
**Field-plot technique with chillies (*Capsicum annuum* L.).**
Trop. Agriculturist 1939 : **93** : 270–75.

The results of a uniformity trial with chillies conducted in Ceylon in 1938–39 are reported. The experimental field had a marked fertility trend and it was shown that long, narrow plots elongated in the direction of this trend gave the lowest errors. Badly orientated elongated plots gave larger errors than square plots. A plot size of 1/45 acre is recommended for trials with chillies.

#### BREEDING 575

260. GATES, R. R. 575:633
**Plant genetics and human welfare.**
Lancet 1939 : **236** : 1472–75.

A review of the major achievements of plant breeders in recent years.

575:633(96.1)
261. JACK, H. W. 63.00.15(96.1)
**Progress notes on the General Experimental Station, Sigatoka.**
Agric. J., Fiji 1939 : **10** : 76–78.

The work in progress at this experiment station in Fiji includes variety trials and selection work on rice, cotton, tobacco, brush millet, maize, potatoes, groundnuts, onions and various vegetables.

262. STOCKDALE, F. 575:633:551.566.1
**The application of economic botany in the tropics.**
Bull. Imp. Inst., Lond. 1939 : **37** : 546–55.

After referring to the early work of Markham, Ledger, Wickham and others in introducing tropical crops to new areas, the author reviews the more important breeding work that has been done on sugar cane, cotton, cinchona, rubber, cacao, bananas, rice, coffee and cassava. The major outstanding problems mostly relate to disease resistance (e.g. to witch-broom disease of cacao, Panama and *Cercospora* leaf spot diseases of bananas) and require the co-operation of plant breeders and pathologists for their solution.

An abstract of this paper, which was prepared for the British Association meeting at Dundee in 1939, appears in the Report of the Association, (Adv. Sci., Lond. 1939: **1**: p. 109).

#### GENETICS 575.1

263. 575.1:576.12
TURRILL, W. B. 633.51:575.1:576.16
**Genetics in relation to evolution and systematics at the Seventh International Genetical Congress, Edinburgh, 1939.**
Kew Bull. 1939 : No. 9 : 500–04.

This paper contains summaries of the papers read at the Plenary Session of the above section of the congress and a list of the other communications read to the section. The papers summarized include one by S. C. Harland on "Genetical studies in the genus *Gossypium* and their relation to evolutionary and taxonomic problems."

264. STEVENS, W. L. 575.116.1:519.24:578.08
**Tables of the recombination fraction estimated from the product ratio.**
J. Genet. 1939 : **39** : 171–80.
Tables are given which enable linkage values and their variances to be determined to the fifth place from $F_2$ or similar data. To determine the linkage value from the table it is first necessary to calculate from the data the value of the ratio of the product of the two crossover classes to the product of the two non-crossover classes. To determine the variance of the recombination fraction, the table is entered with the value of that fraction and the quantity found is divided by $n$, the number of plants in the family.

## ORIGIN OF SPECIES, ETC. 576.1

265. WILLIS, J. C. 576.12:575.3:581.9
**How plants have found their homes, I, II.**
J.R. Hort. Soc. 1939 : **64** : 259–71, 299–313.
This is a discussion of the evolution and geographical distribution of plants in which it is shown that the mechanism of gradual adaptational change under the influence of natural selection, as envisaged by Darwin, is quite inadequate to explain the facts. The mutation theory and the age and area hypothesis are discussed.

## CYTOLOGY 576.3

266. MATHER, K. 576.354.46:576.312.381
**The determination of position in crossing-over. III. The evidence of metaphase chiasmata.**
J. Genet. 1940 : **39** : 205–23.
Chiasma frequency data for a number of organisms which have chromosomes with a large size range were examined and the ratio of the differential distance to the interference distance (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 128) determined. The metaphase configurations in all the organisms except one (*Scilla italica*) were then seen to be of the types to be expected if no movement of interstitial chiasmata had taken place. In the case of *S. italica* the distance from the centromere to the first chiasma was unexpectedly great; it is suggested that this is due to incomplete pachytene pairing in the region of the centromere.
The author concludes that terminalization of chiasmata is an all or none process; either all the chiasmata are terminalized or none of them move, except for occasional movement of the most distal chiasma to the end of a bivalent.

267. FABERGÉ, A. C. 576.356:537.531
**An experiment on chromosome fragmentation in *Tradescantia* by X-rays.**
J. Genet. 1940 : **39** : 229–48.
In *Tradescantia bracteata* the number of chromosome fragments caused by X-ray irradiation increased in a linear manner with increasing dosage. Intermittent dosage gave less fragments than continuous dosage; it appears that the extent to which broken chromosome ends are able to rejoin is dependent upon the number of breaks initially produced. At higher temperatures there were less fragments than at lower temperatures, indicating that the amount of rejoining was greater.

268. DARLINGTON, C. D. 576.356:576.312.381
**The origin of iso-chromosomes.**
J. Genet. 1940 : **39** : 351–61.
The mode of origin of isochromosomes (chromosomes with two identical arms) from telocentric chromosomes which have arisen from misdivision of the centromere is described, on the basis of observations in *Fritillaria*.

269. L . . . ., H. M. 576.356.5:581.04:633
**A new agent for stimulating polyploidy.**
Int. Sug. J. 1939 : **41** : p. 454.
An account of the use of colchicine and acenaphthene in inducing polyploidy in crop plants.

## AGRICULTURE 63

270. 63.00.15(41)
**Recent research on Empire products. A record of work conducted by Government Technical Departments overseas.**
Bull. Imp. Inst., Lond. 1939 : **37** : 368–87.
The following items will be of interest to plant breeders:
T. A. Buckley reports that in Malaya four clones of *Derris elliptica* Changa 3 have been finally selected for multiplication on the basis of high yield and toxin content. The average yield was 15.5 oz. of air-dry root per plant, with a rotenone content of 12.25 per cent of the dry weight.
Experiments conducted in the Gold Coast to determine the pollen vector of cacao are reported. Records of the weight and number of beans per pod were taken from over 800 cacao trees of the Amelonado variety; the results show that the variety is very uniform and offers little scope for selection. A survey shows that on native farms in certain areas many hybrid trees exist, and it is considered that these will give much greater scope for selection work. Compatibility tests on provisional selections of hybrid cacao have been made.
Variety trials with sugar cane in Antigua and St. Kitts-Nevis and with groundnuts in Nigeria are reported. In Dominica H. B. Pidduck reports that 23 lime hybrids planted last year have nearly all flowered and are being back-crossed to old West Indian trees. Rootstock trials of limes and variety tests of other citrus fruits are in progress.
An oil palm research station is being established in Nigeria in the Ekiadolor Forest Reserve, Benin Province. Two selection plots have been laid down, one with progenies of thick-shelled and the other with progenies of thin-shelled Aba selections. Selfed progenies of three thin-shelled selections are being compared with crosses.

## CEREALS 633.1

271. 633.1–2.452–1.521.6:575(94)
WATERHOUSE, W. L. 632.452:576.16
**Some aspects of plant pathology.**
Rep. Aust. Ass. Adv. Sci. 1939 : **24** : 234–59.
After tracing the history of plant pathological research in Australia and New Zealand, the author passes on to a consideration of the problem of physiological specialization in the cereal rusts and its relation to breeding work, particularly in Australia.
The appearance of race 34 of *Puccinia graminis tritici* rendered useless the breeding work then being carried out in Australia to obtain resistant varieties of wheat and new crosses were made using Hope and Webster as resistant parents. Resistance to race 34 is recessive, two main genes apparently operating. Resistance of much greater value is being obtained from the *Triticum durum* variety Gaza by repeatedly back-crossing its hybrids with *T. vulgare* to the latter species. This *T. durum* variety is highly resistant to stem and leaf rusts and to flag smut, and this resistance can readily be incorporated in *T. vulgare*.
Races 16 and 26 of leaf rust of wheat (*P. triticina*) are the only ones present in Australia. Hope and the *T. durum* variety Gaza are again being used as parents. Resistance to this rust is inherited independently from resistance to stem rust.
Six races of stem rust of oats (*P. graminis avenae*) have so far been established in Australia. Nothing is known of the nature of resistance to two of these, races 6 and 8, but resistance to the other four, races 1, 2, 3 and 7 is in some cases determined by a single dominant gene. Since these four races are the only ones commonly occurring, breeding resistant varieties should be simple.
Five races of leaf rust of oats, *P. coronata*, have so far been established. Resistance to race 6 appears to be conditioned by three dominant genes in the cross Algerian x Victoria. In another cross it was shown that this resistance is inherited independently from resistance to race 1 of stem rust.

Resistance to leaf rust of barley, *P. anomala*, is conditioned by a single dominant gene in several crosses; it is inherited independently of resistance to *P. graminis tritici* 34.
At least two strains of *P. dispersa*, leaf rust of rye, have been detected and it is hoped by inbreeding to establish a set of differential varieties of the crop.

## WHEAT 633.11

272. WENHOLZ, H.,
PRIDHAM, J. T.,
VEARS, C. K. and
CURTEIS, W. M. 633.11:575(94)
633.11:575:007
**Wheat varieties in Australia.**
Agric. Gaz. N.S.W. 1939 : **50** : 539–43; **51** : 11–14, 30.

In continuation of the article referred to in "Plant Breeding Abstracts", Vol. X, Abst. 15, descriptions of further Australian wheat varieties are given and also an account of the breeding work of W. J. Farrer.

273. 633.11:575(94.5)
633.13:575(94.5)
633.16:575(94.5)
635.656.00.14(94.5)

**State Research Farm. Annual Field Day.**
J. Dep. Agric. Vict. 1939 : **37** : 459–62, 484–500.

**Guide Book. The State Research Farm, Werribee.**
Dep. Agric. Vict. 1939 : Pp. 49.

A rather full summary of the plant breeding activities of this station, which includes work on wheat, oats and barley appeared in "Plant Breeding Abstracts", Vol. IX, Abst. 566. The following additional points may be noted from the present reports.
Two new barley hybrids, Pryor x Plumage Archer W4463S1–13 and Chevalier x Pryor W4367K3–1 are now undergoing final yield trials. Both have outyielded the malting barleys of Victoria, Pryor and Plumage Archer, and the former is of malting quality superior to Pryor. It is of Plumage-Archer type but earlier in maturity.
In order to raise oat varieties resistant to loose smut (*Ustilago tritici*), the resistant variety Forward has been crossed with high-yielding, susceptible, local varieties.
Variety trials with field peas are reported.

274. MCEWEN, J.,
WALKER, G. W.,
WATERHOUSE, W. L. and
SUTTON, G. L. 633.11:575:007(94.4)
**Commonwealth Farrer Memorial "Lambrigg," Canberra, A.C.T. Unveiling ceremony and dedication, 16th January, 1939.**
Published under the authority of the Farrer Memorial Trust, Sydney, N.S.W. Pp. 23.

A series of addresses in which the life and work of the Australian wheat breeder, W. J. Farrer, are described.

275. WATKINS, A. E. 633.11:575.127.2:575.11:581.46
**The inheritance of glume shape in *Triticum*.**
J. Genet. 1940 : **39** : 249–64.

The shape of the empty glume and the brittleness or toughness of the rachis are the most important characters distinguishing wheat species. It has been shown previously that *T. turgidum* and *T. vulgare* differ from each other in a Mendelian factor pair *K-k* which influences these and other characters; probably these factors represent groups of completely linked genes. *K* and *k* are linked to $B_1$ and $b_1$, the genes for awnletted versus fully awned ears with about 41 per cent of crossing-over. *T. Spelta* carries a third group, $K^s$, allelomorphic with *K* and *k*. It is now shown that *T. dicoccum* carries a group $K^d$ also allelomorphic with *k*, which is similar

to if not identical with $K^s$ of *T. Spelta*, i.e. when $K^d$ is transferred to *T. vulgare*, a form closely resembling *T. Spelta* is produced.
Crosses between the two tetraploid species *T. dicoccum* and *T. turgidum* show no segregation for the characters considered, breeding true to the intermediate condition. It is assumed that this is due to autosyndesis, and that *T. turgidum* can be represented as *KK.KK* and *T. dicoccum* as $K^dK^d.K^dK^d$.
The species and types considered may now be represented as follows: *T. dicoccum* $K^dK^d.K^dK^d$, *T. turgidum KK.KK*. *T. vulgare kk.KK.*$K^dK^d$, speltoid *KK.KK.*$K^dK^d$, *T. Spelta* $K^sK^s.KK.K^dK^d$. *T. durum* probably also has the formula *KK.KK* but with a different gene arrangement within the groups concerned.

276. Wenholz, H. 633.11–2.4–1.521.6:575.127.2
**New wild species of wheat: value to plant breeders.**
Agric. Gaz. N.S.W. 1939 : **50** : p. 543.
The breeding value of *Triticum Timopheevi* is briefly discussed and reference made to the cross with the *T. vulgare* variety, Steinwedel, made by Pridham and referred to at greater length in "Plant Breeding Abstracts", Vol. X, Abst. 16.

277. Miller, W. B., 633.11–2.451.3–1.521.6:575(94.5)
Hore, H. L. and 633.11.00.14(94.5)
Sims, H. J. 633.13.00.14(94.5)
**Mallee Research Station, Walpeup. Experiments and results.**
J. Dep. Agric. Vict. 1939 : **37** : 511–19, 535–46.
The work in progress at the Station includes variety trials on wheat and oats, selection work on wheat, oat and barley hybrids produced at the State Research Farm, Werribee, Victoria, and trials of wheat for resistance to flag smut. An investigation of the mode of inheritance of resistance to flag smut in wheat is also being made.
The results of variety trials are reported and recommendations made.

## OATS 633.13

278. Welsh, J. N. 633.13–2.452–1.521.6:575(71)
**Vanguard oats—origin, description and performance.**
Publ. Dep. Agric., Can. 1939 : No. 651 : Pp. 14; also Fmrs' Bull. No. 76.
A further description of the oat variety Vanguard, which is resistant to the races of stem rust prevalent in Canada (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1019).

## BARLEY 633.16

279. Briggs, F. N. 633.16:575(79.4)
**The history and improvement of malting barley in California.**
J. Inst. Brew. 1940 : **46** : 31–33.
Prior to 1910, the only barley variety grown in California was "Coast", which was introduced by the Spaniards. Large scale variety tests failed to reveal a better malting barley, though two feeding barley varieties, California Mariout and Club Mariout were introduced. The next step was to make pure line selections within the variety Coast. Two outstanding selections now of major importance were California Tennessee Winter, suited to the heavier soils, and Atlas, which now occupies over 80 per cent of the acreage sown to malting varieties. Breeding work is now being resorted to, the aim being not to produce entirely new varieties, but to incorporate in the variety Atlas, by the use of the back-cross method, resistance to mildew and scald.

280. 633.16:575:016
633.79:575:016
Comrie, A. A. D. 632.422.3:575:016
**Report on the Fermentation Industries for 1939.**
Prepared for the Society of Chemical Industry and the Institute of Brewing.
Pp. 30.
An annual review of the scientific literature of subjects related to brewing; it includes mention of breeding work on barley, hops and yeasts.

281. 633.16–2.13–1.521.6:575(71.23)
NEATBY, K. W. 633.11–2.13–1.521.6(71.23)
**Seasonal notes by the Department of Field Crops. I.—Varietal differences in wheat and barley with respect to hail damage.**
Pr. Bull. Dep. Ext. Univ. Alberta 1940 : **25** : 1–2.

Striking differences in resistance to hail damage were noted in Alberta in 1939 in barley varieties under test, and to a lesser extent in wheat varieties. Of 48 barley varieties, in which the amount of damage ranged from 9 to 100 per cent, the most resistant were selections from the cross Trebi x Glabron. Glabron itself showed 66 per cent of damage, while Trebi was lodged and the damage could therefore not be estimated. It is suggested that the resistant progeny were those that combined the erect type of growth of Glabron and the toughness of Trebi.

In wheat the amount of damage ranged from less than 5 per cent in Canus to 41 per cent in a selection of Garnet.

## MILLETS AND SORGHUM 633.17

282. VIJAYARAGHAVAN, C. and
PANDURANGA RAO, V. 633.174:575"793"(54.8)
**The main cause of crop failure in the Black Soil Tract of the Bellary District.**
Madras Agric. J. 1939 : **27** : 271–74.

Crop failure in the Bellary district of Madras is due to the formation of a hard soil layer just below the surface. One approach to the solution of this problem is the breeding of early varieties of plants that produce a vigorous root system reaching the deeper soil layers before the hard pan develops. To this end local sorghums have been crossed with the early American varieties Milo and Wonder and the $F_1$ plants are now to hand.

## RICE 633.18

283. SINGH, R. D. and
KHAN, S. 633.18:575(54.5)
**246 Palman-Suffaid—A fine, high-yielding variety of rice.**
Seas. Notes Punjab Agric. Dep. 1939 : **18** : No. 2 : 15–18.

The Palman rices form a distinct group that has increased greatly in economic importance in late years; they combine a fine, slender grain with the high yield of the coarse varieties. The new variety, 246 Palman Suffaid, selected at the Rice Farm, Kala Shah Kaku, Punjab has consistently outyielded local Palman and other selections.

## FORAGE GRASSES 633.2

284. RANGASWAMI AYYANGAR, G. N. 633.282:575.11:576.16
and PONNAIYA, B. W. X. 633.174:576.16:575.11
**Studies in *Sorghum sudanense*, Stapf—The Sudan grass.**
Proc. Indian Acad. Sci. 1939 : **10** : Sect. B : 237–54.

*S. sudanense* is considered to have contributed to the ancestry of cultivated sorghums and particularly to *S. Dochna*. In support of the latter contention, three rare mutants that are common to *S. sudanense* and *S. Dochna* are described; these are (1) absence of ligules and auricles to the foliage leaves and of pulvini in the inflorescence, determined by a recessive gene *lg*, (2) compact spindle-shaped panicle, caused by the dominant gene $Pa_1$ and (3) the occurrence of a purple wash on the pedicelled spikelets, due to the dominant gene *PW*. In addition the following characters of *S. sudanense*, each determined by a single gene, are listed: seedlings with chlorophyll-deficient bands (recessive gene *cb*); spreading seedling habit (dominant, *SO*); striped leaves (recessive, *cs*); extremely sparse waxy bloom (recessive to the slightly greater amount of bloom usual in the species); presence of pulvini on the secondary branches of the panicle (dominant, $Pa_2$); plants without tillers (recessive, *tx*); tillers all flowering at practically the same time as the main stalk, instead of later (uniform flowering recessive, *tu*); weak midrib (recessive, *md*); bluish green instead of green colour of seedling

(bluish green dominant, $C_{BL}$); very short ("nil") awn versus long awn (short awn dominant). It is shown that *MD* and $C_{BL}$ are independently inherited, and also that in the presence of the weak midrib gene long awns are not expressed and a 9 : 3 : 4 $F_2$ ratio is obtained for normal midrib "nil" awn: normal midrib long awn: weak midrib "nil" awn.

## ROOTS AND TUBERS 633.4

285. DAVIDSON, W. D. 633.491:575(410+41.7)

**Famous potato raisers.**

J.R. Agric. Soc. 1939 : **100** : Pt. II : 1–22.

This is an exhaustive and interesting account of the careers of important private and commercial potato breeders in Britain from the early days of cultivation of the crop to the present day. The histories of all the important varieties are traced, as far as they are known.

286. 633.491:575(47)

**Potato-breeding experiments in Russia.**

J. Dep. Agric., Éire 1939 : **36** : 305–06.

A brief statement of aims of present-day Russian potato breeding and of the success achieved. The chief aims are to evolve varieties which are resistant to frost, blight and virus diseases and which have a high content of protein. Wild varieties that will withstand −10° C. are available and there are cultivated forms that can endure −5° C.

287. 633.491–1.524(8)

SALAMAN, R. N. 633.491–2.411.4–1.521.6:575

**Potato expedition.**

10th Rep. Imp. Agric. Bur., Lond. (1938–39) 1940 : 52–54.

A report is given of the potato expedition to South America organized by the Executive Council of the Imperial Agricultural Bureaux. Some 600 different specimens from Central and South America had been assembled at Cambridge at the time of writing; these are being classified botanically, in part examined cytologically, and tested for their resistance to two strains of *Phytophthora infestans* and other diseases. They will be at the disposal of potato breeders within the British Commonwealth.

It is noted that many of the wild Mexican *Solanum demissum* types are resistant to both forms of blight, while a minority is susceptible to both. All the cultivated Peruvian varieties were susceptible, while a few South American species obtained from Russia were immune. The author has made a large number of crosses between these new blight resistant forms and commercial varieties and his older resistant potatoes.

The breeding possibilities of the potato collection are touched upon.

## FIBRES 633.5

288. ENGLEDOW, F. L. 633.51:575:007(62.4)

**Mr. M. A. Bailey.**

Nature, Lond., 1939 : **144** : 890–91.

A brief account of the work of M. A. Bailey, with particular reference to his work on cotton breeding in the Sudan.

633.51:575.127.2:576.16

289. HUTCHINSON, J. B. 633.51:576.312.35

**The relationships of *Gossypium Raimondii* Ulb.**

Trop. Agriculture, Trin. 1939 : **16** : 271–72.

*G. Raimondii* has a chromosome number of $2n = 26$ and gives viable hybrids with all 52-chromosome species tested and with the diploid species *G. Sturtii*. It could not be crossed with *G. aridum*, *G. Armourianum* or *G. trilobum* and gave only empty seeds with *G. Klotzschianum*, *G. Davidsonii* and other diploid species. It must, however, on morphological grounds be grouped with *G. Klotzschianum* and *G. Davidsonii*; the three species appear to be rather widely separated from other diploid New World cottons.

290. 633.51:575.242:581.45:575.116.1
CHI PAO YU. 633.51:575.11.061.633
**The inheritance and linkage relations of curly leaf and virescent bud, two mutants in Asiatic cotton.**
J. Genet. 1939 : **39** : 69–77.

The curly leaf mutant, which has a curled-up leaf margin, small petals, sub-normal germination power and differs from normal in other ways, is a simple recessive type. The gene concerned (*cu*) is linked to the genes for broad-lobed versus narrow-lobed leaf with about 16·6 per cent of crossing-over; it is inherited independently of anthocyanin pigmentation, yellow corolla, light brown lint and the presence of fuzz on the seeds. It appears that the light brown lint character is determined by a different gene from the brown lint of Hutchinson (cf. "Plant Breeding Abstracts", Vol. IV, Abst. 861).

The virescent bud type has leaves which are chlorophyll deficient when young, but later become a normal green. It is due to a single recessive gene, $v_1$, which is inherited independently of anthocyanin pigmentation, yellow corolla, curly leaf, fuzzy seed, leaf shape and yellow seedling.

Other mutants similar to the above have occurred, but their genetic identity has not yet been tested.

291. CHI PAO YU. 633.51:575.242.061.633:575.116.1:575.113.7
**The inheritance and linkage relations of yellow seedling, a lethal gene in Asiatic cotton.**
J. Genet. 1939 : **39** : 61–68.

A recessive lethal chlorophyll-deficient mutant has appeared independently in three unrelated varieties of Asiatic cotton, the same gene being involved in each case. It is shown that this gene is linked to sun red anthocyanin pigmentation with a cross-over value of about 9 per cent, but is inherited independently of the genes for yellow corolla colour and curly leaf.

292. HANSFORD, C. G. 633.51–2.484–1.521.6:575.42(67.61)
**Vascular diseases of cotton in Uganda.**
E. Afr. Agric. J. 1940 : **5** : 279–82.

The cotton wilts found in Uganda are caused by *Verticillium* and *Fusarium*. The research work being conducted on them is reviewed; it includes the testing of varieties for field resistance and the isolation of resistant strains from mixed varieties.

293. 633.526.2:575.127.2(67.8)
LOCK, G. W. 633.526.23.00.14(67.8)
**Sisal Experimental Station report for the year 1938.**
Pamphl. Dep. Agric. Tanganyika 1939 : No. 25 : Pp. 23.

This report includes preliminary results of variety trials and also mention of *Agave* seedlings grown at the station. These include hybrids between *A. angustifolia*, *A. amaniensis* and *A. sisalana*; they are very diversified and include several types that produce leaves rapidly, opening ten to fifteen leaves monthly. Their fibre characteristics appear to be good.

## SUGAR PLANTS 633.6

294. EVANS, H. and
STEVENSON, G. C. 633.61(69.82)
**A botanical and agricultural description of some sugarcane varieties raised by the Sugarcane Research Station, Mauritius.**
Bull. Dep. Agric., Mauritius 1939 : No. 16 : Pp. 10.

Botanical descriptions and notes on the agricultural value of the five sugar cane varieties so far released by the Station are given. In a preface, N. Craig notes the extent to which these canes are being taken up commercially.

295. 633.61:575(69.82)
633.61–2.7–1.521.6

**Ninth Annual Report of the Sugarcane Research Station, for the year 1938.**

Dep. Agric., Mauritius 1939 : Pp. 65.

A large number of crosses were made in the 1938 season, these are listed and the degree of success of each cross noted. Black Tanna was notably low in fertility as a parent.

The percentage of selected seedlings from various crosses in the first year trials are reported. The arbitrary nature of the process of selecting single stools is stressed; to some extent it is overcome by dividing the trial ground into small areas and selecting a given proportion within each.

Second and third year trials are reported. Three seedlings were promoted to variety trials during the year; two noble seedlings, M.211/33 and M.213/33, derived from the cross R.P.6 x M 23 16 and a fourth nobilization of glagah, M.130 32, from the cross R.P.6 x POJ 2878.

Variety trials provided further information on the varieties already released by the Station. Of these, M.717 30, M 72 31 and M.134 132 have consistently outyielded the standards. M.73 31 has proved disappointing, it has a poor growth habit and is susceptible to borer injury, while rotting organisms spread readily through the canes from the borer holes. M 140 31, an unreleased variety, has been discarded because of its susceptibility to gumming disease.

Gumming disease and *Phytalus* resistance trials are reported.

Botanical investigations include studies of the mechanism of resistance to *Phytalus* and to drought. *Phytalus* resistance seems to be dependent to a large extent on the ability of the plant to form new roots after being attacked. Tests have shown that the amount of infestation also varies inversely as the amount of silica in the roots.

With regard to drought resistance, determinations were made of the amount of growth made by different varieties after severe root pruning, and also of the amount of water lost by excised leaves.

296. 633.61:575(94.3)

**Thirty-ninth annual report of the Bureau of Sugar Experiment Stations.**

Report of the Director to the Hon. the Secretary for Agriculture and Stock, Brisbane 1939 : Pp. 66.

**Annual report of the Director for the year ended 30th June, 1939.**

Cane Gr. Quart. Bull. 1939 : 7 : 84–106.

This report includes accounts of varietal trials, disease and pest resistance trials and sugar cane breeding work in Queensland, as well as of other aspects of cane research.

Owing to the free arrowing that occurred in the 1939 season, it was possible to make a number of new crosses and in all over 120 crosses were made. The storing of seed in sealed containers containing calcium chloride at a temperature just above freezing point has now made it possible to carry seed over to the next season should arrowing be sparse.

A very promising family at the Bundaberg station is P.O.J. 2878 x Co.290. Some of the most promising Q. seedlings in later stages of testing are described; among them Q.10, a cane of early maturity and high sugar content resistant to gumming, top rot and leaf scald in North Queensland that will probably be approved for planting in certain districts in 1940; Q.13, which has appeared to be better than Q.10 so far, but is susceptible to top rot; Q.20, a rather early maturing cane of high sugar content that is being extensively planted experimentally in the Mackay district; Q.25, apparently highly resistant to downy mildew and Q.29 of promise as a stand-over cane on account of its hard rind and freedom from arrowing.

Trials have suggested that the values obtained in tests with the rind hardness machine form a useful index of resistance to rat injury of cane varieties, the rats preferring the soft canes. A number of varieties bred by the Colonial Sugar Refining Company are also under trial; these include varieties resistant to Fiji disease.

297. Vijayasaradhy, M. 633.61:581.331.2:578.08
**"Thermo" or "vacuum" flasks for preserving sugarcane pollen.**
Curr. Sci. 1939 : **8** : 554–555.
A portable device for storing sugar cane pollen under controlled conditions of temperature and humidity is described. The pollen is stored on watch glasses on tiered staging, in a test tube containing sulphuric acid and water, and is placed in a vacuum flask containing water ice-cooled to the appropriate temperature.

## STIMULANTS 633.7

298. 633.71:575(68.9)
**Tobacco research. Programme for present season.**
Rhod. Agric. J., 1939 : **36** : 825–26.
A brief account of the projected programme of tobacco research for 1940 to be conducted at the Trelawney Research Station, Rhodesia. The plant breeding work includes testing and selection of 36 strains of a number of varieties brought forward from last year, and the trial selection of more recently imported varieties. Work on mosaic resistance will be continued.

299. Sadik, H. G. and
Noor Mohammad. 633.71:575.42(54.5)
**A promising type of Hukka tobacco (Jullundur Selection No. 5).**
Seas. Notes Punjab Agric. Dep. 1939 : **18** : No. 2 : 45–46.
Variety tests in the Punjab failed to lead to the discovery of any high yielding tobacco of sufficiently good quality for market requirements. Selection for yield was therefore carried out on the local variety and the new variety, Jullundur Selection No. 5, gives some 50 per cent more yield without being inferior in quality.

300. 633.72:581.165.1:575.42(54,
633.72:581.162.52:575.125
**Annual Report of the Tocklai Experimental Station, 1938.**
Sci. Dep., Indian Tea Ass., Calcutta 1939 : Pp. 40.
This report includes mention of progress made in the vegetative propagation of selected tea bushes. Small clones are being established for further selection. It is pointed out that areas planted to a single clone would not be suitable for seed production, since tea is partially self-sterile and it has been shown that selfing leads to a loss of vigour. At least two different clones must therefore be present where seed is required.

301. Krug, C. A. and
Mendes, A. J. T. 633.73:575.127.2:576.354.4
**Cytological observations in *Coffea*. IV.**
J. Genet. 1940 : **39** : 189–203.
The triploid hybrid *C. arabica* ($2n = 44$) x *C. canephora* ($2n = 22$) was intermediate between the parents in shape and size of leaf and flower characters, there being no evidence of heterosis.
Meiotic behaviour in this hybrid is described in some detail. In pollen mother cells $6–20_{I}$, $2–11_{II}$ and $0–5_{III}$ were observed, the mean value for metaphase plates being $14.4_{I} + 5.4_{II} + 2.6_{III}$. It is considered likely that most of the pairing is due to autosyndesis of the *C. arabica* chromosomes, suggesting that this species may have been of autotetraploid origin. This suggestion does not, however, receive support from genetic studies, since most of the characters so far studied are determined by single and not duplicate pairs of genes. The occurrence of trivalents shows that there is some homology between the chromosomes of *C. arabica* and *C. canephora*.
Later stages in microsporogenesis are, as would be expected, highly irregular and the hybrid did not produce viable seed from artificial self- and cross-pollination. Two daughter plants, both with $2n = 44$, were obtained by open pollination, probably by 22-chromosome pollen.

302. 633.73:575.2:575:578.08
HALCROW, M. 633.73–1.557:581.6
**Individual tree recording for yield and quality.**
Mon. Bull. Coffee Bd Kenya 1939 : **5** : 210–11.
The technique used in individual yield and quality recording of coffee trees at the Scott Agricultural Laboratories, Kenya, is described. Owing to the tendency to biennial bearing, five or six years' recording is necessary, but some idea of a tree's potentialities is obtained after two or three years. Less than one per cent of trees appear to average more than 20 cwt. of clean coffee per acre, and less than five per cent yield over 15 cwt. There is much variation between trees in the shape and size of the beans, but no striking variation in liquor.

## AROMATIC PLANTS 633.8

303. 633.841:581.148:631.521.6:575(54.8)
THOMAS, K. M. and 633.841–2.7–1.521.6:575
KRISHNA MENON, K. 633.841–2.483–1.521.6:575
**The present position of pollu disease of pepper in Malabar.**
Madras Agric. J. 1939 : **27** : 348–56.
Pollu disease of pepper (*Piper nigrum*) may be caused by (1) spike shedding (2) attack by the flea beetle *Longitarsus nigripennis* or (3) infection by a species of *Colletotrichum*. Trials show that varieties of the crop may differ significantly in the amount of spike shedding and of pollu, and it is suggested that a thorough search for resistant types should be made among the cultivated and wild peppers of India. Valuable new resistant varieties may then be bred by selection or hybridization.

## OIL PLANTS 633.85

304. ALI MOHAMMAD. 633.85:575(54.5)
**Breeding of improved varieties of oilseeds in the Punjab.**
Seas. Notes Punjab Agric. Dep. 1939 : **18** : No. 2 : 21–24.
In the rape seed group, mass selection work has been done on the cross-pollinated types, toria, brown sarson and taramira. This has resulted in higher yields, purity and oil content. A scheme of continuous selection to maintain a high standard has been initiated.
Many pure lines have been selected in the self-fertilized forms of yellow sarson and raya (*Brassica juncea*). Raya O.B.1 has so far given the best results (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 619). A new type of raya, L–16, which is early ripening has recently been evolved. It has outyielded toria in preliminary trials.
New self-fertile forms have also been selected from crosses between self-fertile and self-sterile types. Some of the hybrids appear very promising; the best are being multiplied for large-scale trials.
With respect to linseed, several high yielding and bold seeded types have been selected. The most important problem is the production of a high yielding yellow seeded type; several such lines, produced by crossing brown seeded Punjab types with yellow seeded Pusa hybrids, are now under trial. A bold-seeded prostrate type for the hills is also being sought.
Selection work on groundnuts has also been carried out and three spreading varieties, A–2, B–1 and D–3, have given the best results. D–3 has proved outstanding in yielding ability, high oil content and seed to pod ratio.
Thirty-four types of sesamum have been isolated from local mixtures and the best are being tried. Crosses have also been made to try to obtain a high yielding, disease resistant, white seeded type. They are now in the $F_3$ stage.
Preliminary studies are also being made on the soya bean.

305. 633.854.56:575
WEBSTER, C. C. 633.854.56:577.8:575.2
**Recent progress in the cultivation of tung oil trees (*Aleurites fordii* and *A. montana*).**
Trop. Agriculture, Trin. 1939 : **16** : 267–71.
The attempts that have been made in various parts of the world to grow tung oil trees as a

plantation crop are reviewed. None of these attempts has so far been commercially successful. One important reason is the great variability found in plantings of either species, especially in the proportion of female to male flowers borne on a tree. Many trees bear almost entirely male flowers and are therefore very low-yielding. An essential prerequisite to successful planting may therefore be a programme of individual tree recording followed by selection and clonal propagation of the highest yielders.

Breeding work has already been started in some countries, notably in Java and in Indo-China, where seed from selected high yielders is now being distributed.

## MEDICINAL PLANTS 633.88

306. 633.885.1–1.524:575

**The world's cinchona bark industry—I, II.**

Bull. Imp. Inst., Lond., 1939 : **37** : 18–31, 183–96; also Trop. Agriculturist 1939 : **93** : 288–308.

The efforts that have been made to establish cinchona in various parts of the world and the present position of the industry are reviewed. Mention is made of the breeding and selection that has been done, principally in Java, but also in Ceylon and the Belgian Congo.

The work in Java has been referred to from time to time in "Plant Breeding Abstracts" and a review of the work in the Belgian Congo appears in Abst. 521. In Ceylon experimental work on grafting and the selection of high-yielding strains for scions is being carried out, and *Cinchona succirubra* x *C. Ledgeriana* hybrids are also under test.

## RUBBER PLANTS 633.91

307. 633.912:575(91)

MANN, C. E. T. 633.912:519.241.1:631.557

**Annual Report. Botanical Division.**

Rep. Rubb. Res. Inst. Malaya (1938) 1939 : 59–114.

Experiments on the vegetative propagation of *Hevea* and tests of stocks and of stock-scion relationships are reported. Test tappings of proved clones both on the experiment station and on estates are being continued.

Tapping tests show that new clones which outyield the best now commercially available are not likely to be obtained by selection of estate trees, and breeding work must be resorted to. The R.R.I. 500 series of clones, resulting from crosses made in 1928–31 continue to show great promise. Some of the seedlings from the Tjikadoe Isolated Seed Gardens are giving comparable yields, but such clonal seedlings show considerable variability and it will probably always be possible by selecting the highest-yielding trees of any family, to establish clones which give higher yields than the family average.

During 1938 hybridization work was continued, crosses being made between some of the clones of the 500 series and with Pilmoor B.84, Tjirandji 1 and Tjirandji 16. Pilmoor B.84 proved to be difficult to use as a female parent since its female flowers aborted freely; this peculiarity was inherited by R.R.I. 500, a daughter clone of B.84. It was also found that clones descended from B.84 show considerable sterility when intercrossed or back-crossed to the parent.

Yields of families of crosses made in 1928–1931 are recorded; the most promising are those derived from Pilmoor B.84. Particularly promising are the families B.84 x B.58 and B.84 x D.65; buddings from seedling mother trees of these families will probably be given R.R.I. clone numbers and tested further.

Yields of various families of seedlings derived from open-pollinated clones are listed; Pilmoor B.84 was again outstanding as a parent and certain other families are promising.

Correlation studies between yield in early test tappings and yield of mature trees are reported; as the trees grow older the correlation becomes less close but is still significant.

## NUTS 634.5

308. 634.53–2.421.9–1.521.6:575.127.2(73)

**A blight resistant chestnut.**

Sci. Amer. 1939 : **161** : p. 93; also Madras Agric. J. 1939 : **27** :375–76.

A hybrid of an American chestnut with the Chinese chestnut, *Castanea mollissima*, which is resistant to blight (*Endothia parasitica*) and which has a nut similar to the American parent in size, quality and sweetness has been selected at the Bartlett Tree Research Laboratories, U.S.A. Seedlings of this tree are being distributed.

## PALMACEOUS AND OTHER TREE FRUITS 634.6

309. 634.651:577.8:575.11

HOFMEYR, J. D. J. 634.651:575.116.1.061.6

**Genetical studies of *Carica papaya* L. (abbreviated).**

S. Afr. J. Sci. 1938 : **35** : 300–04.

This paper is an amplified version of that summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 85.

## FORESTRY 634.9

310. JOHNSON, L. P. V. 634.97:575(71.3)

**The breeding of forest trees.**

For. Chron. 1939 : **15** : 139–51.

The various methods of procedure open to the forest tree breeder are outlined; most important are those which would enable him to reduce the time taken to achieve practical results. These include direct use of the $F_1$, either by vegetative propagation with or without the use of auxins to aid rooting, or by planting the parent trees together in such circumstances that large quantities of hybrid seed will be obtained. Another possible method is the production of polyploid forms by colchicine treatment. Where later generations have to be utilized work may in some cases be speeded up by grafting scions of young trees on to sexually mature stocks so as to induce early flowering. A tentative programme of tree breeding based on these considerations is outlined.

Forest tree breeding work in Canada was started in 1938 under the joint auspices of the National Research Council and the Dominion Forest Service. To date various interspecific hybrids of *Populus* and *Picea* have been obtained and extensive crossing has been done in *Pinus* and to a lesser extent in *Tilia*. Colchicine treatment of seeds of 27 species from 12 genera to produce polyploids has been highly effective in nearly all cases. Investigations on the use of hormones to root cuttings are also under way.

Research institutions in other parts of the world that are engaged in tree breeding work are listed and a selected bibliography of references on the subject given.

311. JOHNSON, L. P. V. 634.97:575.127.2:016

**A descriptive list of natural and artificial interspecific hybrids in North American forest-tree genera.**

Canad. J. Res. 1939 : **17** : Sect. C : 411–44.

The literature on interspecific hybrids of trees belonging to genera which are represented in North America by species of considerable economic importance is summarized in tabular form. Some 405 hybrids in 28 genera are listed. Chromosome numbers are given where possible. There is a bibliography of 110 references.

## VEGETABLES 635

312. MENSINKAI, S. W. 635.25/6:576.312.35:576.354.4:576.356:576.16

**Cytogenetic studies in the genus *Allium*.**

J. Genet. 1939 : **39** : 1–45.

Seventeen species of *Allium* were studied cytologically. Chromosome numbers are given, in 15 cases for the first time, and the karyotype and meiotic behaviour of many of the species are described and discussed in relation to the evolution of the genus. The basic chromosome

number appears to be 8 but 7 and 9 and also multiples of 7, 8 and 9 are also met with. Some 30 per cent of the species in the genus are polyploid. Many cases of inversion and translocation of chromosome segments were detected. The species studied included two of economic significance, *A. Cepa* and *A. sativum*. Both these are diploids ($n = 8$) but have two pairs of nucleolar chromosomes, the possible origin of which is discussed. *A. Cepa* shows occasional segmental interchange and inversion. Meiosis in *A. sativum* could not be studied.

313. POWERS, L. 635.64:575.113.4–18:519.24
**Studies on the nature of the interactions of the genes differentiating quantitative characters in a cross between *Lycopersicon esculentum* and *L. pimpinellifolium*.**
J. Genet. 1939 : **39** : 139–70.

Data on the number of loculi and size of fruit in *Lycopersicon esculentum* var. Johannisfeuer, and *L. pimpinellifolium* var. Red Currant, their $F_1$, $F_2$ and back-cross of the $F_1$ to both parents are given. A randomized block design was used. The variances of fruit size and loculus number of the different classes distinguished by marker genes were not always the same, nor were the variances of the different types of family. There were at least three and most probably more genes affecting the two quantitative characters segregating in this cross. The different genes were geometrically cumulative as might be expected from a morphogenetic consideration of the problem, but allelomorphs of the same gene interacted in quite a distinct way, showing marked dominance. The importance of drawing the distinction between the dominance relations of allelomorphs and the interaction between non-allelomorphic genes is strongly emphasized. (See also Abst. 330 below.) K. M.

314. SANSOME, E. R. and 635.656:581.162.5:575.242
SANSOME, F. W. 635.656:575.11:576.356:581.162.5
**Genetical sterility in *Pisum sativum*.**
Nature, Lond. 1940 : **145** : p. 226.

Completely sterile plants were observed by Pellew in the offspring of a plant chimerical for a reciprocal translocation. The sterility was found to be due to complete failure of pairing at meiosis. The character is inherited as a recessive, and may be due to a single gene; it is considered to be more likely, however, to be due to a deficiency or duplication associated with the reciprocal translocation.

# Part II. Foreign.

## STATISTICS 519

315. Dudok van Heel, J. P. 519.24:631.421:633.63(49.2)
Iets over proefvelden. (**Some comments on experiment plots**).
Van Zaad tot Suiker 1939 : No. 9 : 136–38.

A comparison is made of the results obtainable in practical variety trials by farmers and in tests conducted under strict scientific control. The importance of proper attention to seed production and cultural measures is mentioned.
The effectiveness of selection for earliness during the past 50 years is shown by the early maturity of the Kuhn P beet which meets Dutch economic requirements so satisfactorily.
The author holds that too few beets are used in sampling practical trial plots and recommends that records should be obtained for all the various areas under each variety in a district in order to provide adequate material for the comparison of varieties.

## BREEDING 575

316. Pires, D. R. V. 575:633(42+48.5)
Métodos de melhoramento em Svalöf e Cambridge. (**Methods of plant breeding at Svalöf and Cambridge**).
Palestras Agron., Lisboa (1938) 1939 : **1** : Pp. 12.

In describing the breeding problems and methods of the two countries, comment is made upon the close association between the Cambridge Plant Breeding Institute and the National Institute of Agricultural Botany in the production of new varieties, and on the restriction of the number of varieties worked with which is possible only after long years of experience.
The differences in method at the two stations are pointed out: these consist mainly in the fact that at Svalöf "preliminary tests" are started in the $F_4$ generation while at Cambridge these are started only in the $F_7$, the size of the populations employed being much less. The special bulk method of Svalöf is also referred to as being used almost exclusively also by Roemer at Halle.

317. Méneret, G. 575:633(44)
Amélioration et expérimentation de plantes de grande culture au Centre de Recherches Agronomiques de Colmar en 1937–38. (**Crop plant improvement and experimentation at the Colmar Agronomic Research Centre in 1937-38**).
Sélectionneur 1939 : **8** : 23–40.

A report for 1938 on the yield, quality, earliness and disease resistance of varieties of wheat, malting barleys, potatoes and lucerne (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1151).
H. du Joncquois wheat, which eared on the 6th June (as compared with the 2nd to the 5th for most of the other varieties tested), ranked first as regards yield though its average for 1936–38 was somewhat lower than that for Préparateur, Etienne and H. de Bersée.
Extensimeter tests showed the quality of the 1938 wheats to be definitely superior to that for the two previous years.
In spite of reverses, attributed to weather conditions, the crosses between winter (Probsdorf) and spring barleys (strains 142 and 179) are still being studied in hopes of isolating lines as resistant to cold as Probsdorf but more resistant to lodging and superior in colour and size of the grain.
In an attempt to obtain new types to be used in breeding high grade malting barleys the $F_6$ (1939) of the cross S.142 x Imperial V has been found to contain some lines remarkable for their resistance to lodging and *Oidium* and for their earliness. Imperial V x S.179 has also given interesting lines.
Studies of environmental effects and adaptive capacity of different varieties are in progress at different centres and the effects of time of sowing on yield and quality among other characteristics are being investigated.

Variety tests of potatoes were conducted to determine their relative yields, quality and disease resistance. On the whole the quality was higher than in 1937, especially in the case of Muntinga 17. Trials of the results of cultivation at high altitudes were also made.
The preliminary stages of lucerne selection were continued.

318. Makhnorylo, V. F. 575:633(47)
**(The Stalinsk Breeding Station at the Soviet Agricultural Exhibition).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 21–22.

The products of the station include new varieties of silage sunflower with increased yield of vegetative matter, the wheat Artemovka 01418 which is superior in yield and resistant to Hessian fly, high yielding awnless forms of *Triticum durum*, an early maturing, drought resistant, disease resistant barley selection with large grains, Stepnjak 0591, and a hybrid barley Donetskii G-594, resistant to drought, with large grain, which has outyielded the standard by 22·9 per cent. An early maturing naked barley almost free from awns has been produced by selection and has given satisfactory yields.

319. Pakhomova, V. P. 575:633(47)
**(The Kharkov Agricultural Breeding Station, a participator in the Soviet Agricultural Exhibition).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 16–19.

The first work of the station consisted in studying and selecting the local races of crop plants. The winter wheat variety Novojur'evka was produced by crossing Ukrainka with Jur'evka; the hybrid is awnless, mid-early, has large grains, and possesses resistance to drought and frost combined with excellent baking quality. The winter wheat Erythrospermum 0917 is resistant to smut and bunt and to cold, and is possessed of good baking quality and yield. Ferrugineum 01239 exceeds all other varieties in frost resistance and is resistant also to smut (*Ustilago*) and of good baking quality.
The barley Europeum 0353 133 is characterized by large grain, smut resistance and high yield, the oat variety 0596 by earliness, thin husk and high yield.

320. Prijamopol'skii, P. K. 575:633(47)
**(The Voroshilovsk Breeding Station, participator in the Soviet Agricultural Exhibition).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 32–33.

The work of the station includes the production of perennial forms of a number of crops, the creation of the wheat Kanred x Fulcaster which is replacing Kooperatorka, the production of hybrids between sunflower and Jerusalem artichoke and the improvement of the local strains of wheat.

321. Rjazanov, K. D. 575:633(47)
**(Demonstration at the Soviet Agricultural Exhibition of the achievements of the Tadjik Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 19–20.

The spring wheat variety Surkhak 05688, obtained by selection from a local strain, is distinguished by large grain of good quality, relative resistance to *Ustilago* and freedom from shedding. It has outyielded the standard by 22 per cent. The spring wheat Irady 01006, selected from an Afghan variety is resistant to bunt and smut, rust and drought and is early in maturity.
Among the barleys, Khardžan 018 is a selection from a local strain; it is winter-hardy, distinguished by high tillering capacity, rapid growth and exceptionally high yield; it has large elongated grains but unfortunately tends to shatter at maturity.

322. Skvortsov, S. N. 575:633(47)
**(Demonstration at the Soviet Agricultural Exhibition of achievements in the work of breeding and seed production).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 6–10.

Among the achievements of Soviet plant breeding referred to are the results of T. D. Lysenko and the production of a number of new crop varieties. These include: a new wheat Novojur'evka, from a cross Ukrainka x Jur'evka, which has outyielded the parents by 5·3 per cent; a new wheat Pervenets, resistant to all three rusts and to bunt (*Tilletia*); the *Triticum-Agropyron* amphidiploid, a valuable new fodder plant; perennial wheat-rye hybrids that have exceeded Ukrainka in yield; perennial ryes with a tough rachis that have outyielded the standard rye varieties; promising wheat varieties of improved yielding ability obtained by selection from land races; and improved strains of most crops in all parts of the U.S.S.R.

323. 575:633(49.5)
633.2–1.524.4(49.5)
Panos, D. A. 633.3–1.524.4(49.5)
Fünf Jahre Pflanzenzüchtung in Griechenland. **(Five years' plant breeding in Greece).**
Züchter 1939 : **11** : 341–46.

Greece has one of the largest cereal growing areas in Europe but its yields are the lowest of any country. The breeding of suitable forage crops, particularly legumes, to introduce into the crop rotation is an urgent necessity. A collection of the local forms of *Pisum, Vicia, Lathyrus, Lens, Phaseolus, Cicer* and *Glycine*, comprising 386 types, has been made, to which a further collection of 883 types from countries with similar growth conditions has been added. Yield tests have been made on these collections and the best forms have been selected. Various crosses have also been made.
A collection of 670 types of local forage grasses suitable for laying down permanent pastures has been made and is being compared with a similar collection of imported forms.
Breeding work is in progress with sunflower.

324. Schwanitz. 575:633:575.127
Artkreuzung im Dienste der Pflanzenzüchtung. **(Species crossing as an aid to plant breeding).**
Wien. landw. Ztg. 1939 : **89** : 81–82.

The domestic plum, the pineapple strawberry, many grasses and ornamental plants and lucernes are among the chance interspecific hybrids mentioned as having great importance in cultivation. As examples of success in artificial species crossing, work in tomatoes, potatoes, beans, various fruit trees and poplars is mentioned and the method is pronounced to be one of great possibilities.

325. Salamatov, M. N. 575:634(47)
**(The Chelyabinsk Fruit and Berry Cultures Experimental Station).**
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I.V. Michurin) 1937 : Nos 5–6 : 109–17.

The achievements of the breeding section include the production of a new apple named Malinovka, distinguished by its good flavour and bright red skin.
*Cerasus fruticosa* has been crossed with cultivated cherries. A seedling of unknown origin of unusual frost resistance has been named Chelyabka; it has deep red fruits with a pleasant sweetish acid flavour.
Large numbers of seedlings have been raised from plums and various other fruits, berries and nuts.

326. Pirovano, A. 575:634:581.037
Interventi elettrici nella genetica orticola a scopo utilitario. (**Electrical intervention in horticultural genetics with a practical object**).
Atti III Riunione Soc. Ital. Genet. Eugen., Bologna (5th–7th September, 1938) 1939 : Pp. 7.
It is claimed that the number of desirable types selected in the progeny of various peach and vine crosses was higher in the populations obtained from pollen treated with an electromagnetic field than in untreated material.

## GENETICS 575.1

327. 575.1:001.4
576.356.2:001.4
**The symbolizing of genes and of chromosome aberrations.**
Chronica Botanica 1939 : **5** : 479–80.
A list of rules for symbolizing genes and chromosome aberrations drawn up by a representative international committee and discussed prior to the Seventh International Genetical Congress held in Edinburgh in 1939.

328. 575.1:061.6(82)
El Instituto de Genetica. (**The Institute of Genetics**).
Inst. Genet., Fac. Agron. Vet., Univ. B. Aires 1939 : **1** : Fasc. 2 : Pp. 35.
This bulletin gives a report of the activities of the newly founded institute, which is part of the Faculty of Agronomy and Veterinary Science of the University of Buenos Aires. They include a visit by the Director to various universities in the U.S.A., an account of whose work in genetics and cytology is given.
The plan of work for the new institute is presented. Breeding and genetic work is being undertaken in maize, where much use is being made of the variety Amargo, resistant to locust attack; also in cereals, flax, sunflower, lucerne, soya bean, potatoes and various other vegetables.
Courses of instruction are also given and the programme of the courses is reproduced.

329. Beadle, G. W. 575.1:581.1
**Physiological aspects of genetics.**
Annu. Rev. Physiol. 1939 : **1** : 41–62.
A review article in which recent work on the following aspects of physiological genetics, among others, is considered: the genetics of pigmentation and mode of action of colour genes, heterosis, the inheritance of size and form, geotropic response, self-sterility, biennial habit, etc., lethal genes, extranuclear hereditary determiners and the use of chemical agents for inducing polyploidy and mutation.

330. Powers, L. 575.113.4–18:519.24:635.64
**Formulas for determining theoretical effects of certain genetic factors upon inheritance of quantitative characters, with special reference to a study of a *Lycopersicon* hybrid.**
J. Agric. Res. 1939 : **59** : 555–77.
Very frequently qualitative genes are used as markers in the analysis of quantitative inheritance. The various classes, distinguished by qualitative genes, also differ metrically on account of quantitative genes linked to the markers. Formulae are given relating the mean differences between such classes to the tightness of the linkages between quantitative and marker genes and the dominance relations of the former in back-crosses and $F_2$. The case where the quantitative gene lies between two markers is given special consideration. Tables of the class mean differences for chosen linkage and dominance values are given. The question of possible confounding of the effects of double crossing-over and of dominance with factor interaction is given detailed consideration. Data on loculus number in a cross between *Lycopersicon esculentum* var. Johannisfeuer and *L. pimpinellifolium* var. Red Currant are

analysed by means of the formulae. It is concluded that at least three, and probably more, genes controlling loculus number were segregating, that the allelomorphs for small loculus number show complete or almost complete dominance and that the genes interact geometrically. (See also Abst. 313). K. M.

331. Avery, G. S. (jun.),
Creighton, H. B. and
Shalucha, B. 575.125:577.17:633.15
**Growth hormones and heterosis.**
Amer. J. Bot. 1939 : **26** : p. 22s. (Abst.)

$F_1$ maize hybrids were intermediate between their inbred parents in content of growth hormone per gramme of endosperm.

332. 575.183:634
Angeli, G. 634.11:575.183
Xenie, carpoxenie o mutazioni somatiche in frutticoltura. (**Xenia, carpoxenia or somatic mutations in fruit cultivation**).
Ann. Tec. Agr., Roma 1939 : **12** : 9–36.

The development of the reproductive organs in the main groups of fruit trees is described and a number of cases of xenia and carpoxenia are reviewed. Cases of supposed influence of the pollen parent upon the resulting fruit are regarded as highly dubious, many having been already disproved, others resting on very inadequate numerical evidence. Others would appear to be in reality somatic mutations.

The author's measurements of 800 seeds from an apple cross showed the average length to be 8·46 mm. and average breadth 4·95 mm. in the cross Bismark x Mantovana and 7·32 and 3·81 mm. respectively in the reciprocal.

333. Sax, K. 575.243:576.312.36:575.113.7:537.531
**The physiological and genetic effects of X-rays.**
Amer. J. Bot. 1939 : **26** : p. 4s. (Abst.)

X-ray irradiation produces a physiological effect which results in a partial fusion of metaphase chromosomes and a temporary alteration of nuclear development, as well as permanent genetic changes, of which only homozygous deficiencies are lethal in diploid cells. Either the genetic or physiological effects of irradiation may be lethal.

334. Roland, G. 575.243:581.02:576.356.5
Méthodes artificielles permettant de provoquer des mutations et de produire des variétés polyploïdes. (**Artificial methods of inducing mutations and producing polyploid varieties**).
Publ. Inst. Belge Amélior. Better. 1939 : **7** : p. 188.

A brief note based on recent literature most of which has already been reviewed in "Plant Breeding Abstracts".

335. 575.243:581.04:575:633
De toepassing van colchicine in het erfelijkheidsonderzoek. (**The utilization of colchicine in research on inheritance**).
Erfelijkheid in Praktijk, Leiden 1939 : **4** : 161–63.

A concise survey of the subject treated under the following heads: artificial mutation in general, colchicine effects, the historical aspect, and recent developments and possible future applications.

A recent bibliography is appended and "The Action and Use of Colchicine in the Production of Polyploid Plants" (published by the Imperial Bureau of Plant Breeding and Genetics, Cambridge) is specifically recommended as a general introduction to the subject.

336. Doutreligne, J. 576.312.3
Les divers "types" de structure nucléaire et de mitose somatique chez les phanérogames. (**The various types of nuclear structure and mitosis in phanerogams**).
Cellule 1939 : **48** : 191–212.

An examination was made of mitosis and the resting nucleus in several Bromeliaceae (including *Ananas microcephala*), *Coffea arabica*, *Gossypium herbaceum*, *Hordeum vulgare*, *Picea excelsa* and *Pinus sylvestris*. Of these the Bromeliaceae, *Coffea* and *Gossypium* have resting nuclei which appear homogeneous except for a nucleolus and a number of chromocentres which is never more and often less than the number of chromosomes. The remaining types show a reticular resting nucleus.
In the Bromeliaceae the number of chromocentres was much less than the number of chromosomes. It is considered likely that the missing chromocentres are really present but are below the limits of visibility.
The nucleolar cycle is also discussed.

337. 576.312.332:576.356
Jensen, H. W. 576.354.4
**On the questionable existence of sex chromosomes in the angiosperms.**
Amer. Nat. 1940 : **74** : 67–88.

The author states that in various plants examined by him the chromosomes undoubtedly form a continuous spireme at meiotic prophase and he deduces that chromosomes do not synapse at this stage, as is popularly supposed. Individuality of chromosomes in general and of sex chromosomes in particular is therefore held to be an impossibility.
Nearly all the described cases of sex chromosomes in higher plants relate to species which are members of polymorphic genera which also contain monoecious or hermaphrodite species. It is pointed out that the sex-determining mechanism must therefore have arisen relatively recently in the phylogeny. Many species with apparent sex chromosomes show evidence of hybrid origin in their meiotic behaviour and it is pointed out that the dioecious condition would tend to perpetuate irregularities due to this cause. It is held that the presence of heteromorphic bivalents in such species is insufficient evidence of the presence of a sex chromosome mechanism.

338. Kostoff, D. 576.312.34
**Further studies upon the chromosome structure and behaviour.**
Cellule 1939 : **48** : 179–86.

Evidence is presented to show that the mitotic anaphase chromosome consists of two threads and the metaphase chromosome of four threads, and that the "splitting" of threads occurs during the resting stage.
The chromomere hypothesis is discussed in relation to the structure of heterochromatic and euchromatic regions in chromosomes (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 17).

339. Kuwada, Y. 576.312.34:016
**Chromosome structure. A critical review.**
Cytologia, Tokyo 1939 : **10** : 213–56.

A useful review of the subject, in which special reference is made to the problems of spiralization in chromosomes. There is an extensive bibliography. A more general review of the same subject is referred to in Abst. 340 below.

340. Nebel, B. R. 576.312.34:016
**Chromosome structure.**
Bot. Rev. 1939 : **5** : 563–626.

An extensive review of the problems of chromosome structure, with a bibliography of some 300 references. A more detailed consideration of spiralization in chromosomes is given in the review referred to in Abst. 339 above.

341. Câmara, A. and
Valadares, M. 576.312.381:537.531:635.651
Sur l'existence de régions favorables à la rupture chromosomique. (**On the existence of regions favourable to chromosome rupture**).
Arch. Portug. Sci. Biol. 1938 : **4** : 237–50.
Cytological observations following irradiation of meristematic root tissue in *Vicia Faba* with X rays demonstrated that in *Vicia* the region bordering on the nucleolar filament of the *M* chromosome shows a particular tendency to rupture.
The technique is described and the results are discussed with those of other workers.

342. Bleier, H. 576.35:633.11:575.127.2
Mechanismus der Kernteilung. (**The mechanism of nuclear division**).
Arch. exp. Zellforsch. 1938 : **22** : 257–62.
Observations of many authors are cited in support of the view that the nuclear material retains its individuality in the intervals between division. The fact that the univalents at metaphase in interspecific wheat hybrids travel to the equatorial plate, i.e. in the opposite direction to the gemini, is taken as proof that chromosome movement is the result of a force exerted by the chromosomes themselves and in some way connected with their longitudinal division.

343. Schrader, F. 576.353:576.312.381
**The present status of mitosis.**
Amer. Nat. 1940 : **74** : 25–33.
The development of modern conceptions of the mechanism of mitosis is traced and some of the difficulties and complications of theories based on electrostatic fields pointed out.

344. Gregory, W. C. 576.354.4:581.01:635.64
**Meiosis and the cultivation of excised anthers in nutrient solution.**
Amer. J. Bot. 1939 : **26** : 3s–4s. (Abst.)
Excised anthers of *Lilium*, *Lycopersicon* and *Datura* cultivated in nutrient media showed abnormal growth or none at all, and meiosis failed in all three species. In *Lycopersicon* meiosis failed in a cutting unless this was grafted on to a rootstock, when it proceeded normally. This suggests that the meiotic stimulus is dependent upon regions of the plant remote from the sporogenous tissue.

345. Jeffrey, E. C. and
Haertl, E. J. 576.354.46:576.312.34
**The chromosomal crepusculum.**
Amer. Nat. 1939 : **73** : 560–64.
The authors consider that the chiasmatype theory is not founded on any adequate factual basis, their arguments being based on the observation of two coiled chromatids in anaphase chromosomes of somatic divisions and of the second meiotic division in *Tradescantia* and other monocotyledons.

346. Villars, R. 576.356:537.531
Contribution à l'étude cytologique de l'action des rayons X sur les cellules végétales. (**On the cytological study of the action of X-rays on plant cells**).
C.R. Soc. Biol., Paris 1939 : **131** : 947–50.
A record of observations of the sequence of the effects of X-rays upon root cells of *Pinus Pinea*, *Vicia Faba*, *Lupinus albus*, *Helianthus uniflorus* and *Hyacinthus annuus*. In general, immediately after irradiation the mitoses were normal though less numerous than in the controls; then they decreased considerably in number; but atypical divisions due to the primary effect of irradiation did not appear till about one hour after treatment. Behaviour differed somewhat in the various plants, but generally speaking, in all cases the atypical divisions subsequently gradually became fewer; about three hours after treatment the quiescent phase set in, the time depending on the dosage and the species involved.

347. Sax, K. 576.356.2:537.531:581.02
**An analysis of X-ray induced chromosomal aberrations in Tradescantia.**
Genetics 1940 : **25** : 41–68.
A further study of the factors influencing the frequency of different types of chromosome breaks caused by X-ray treatment (cf. "Plant Breeding Abstracts", Vol. X, Abst. 94).

348. Stebbins, G. L. (jun.) 576.356.5:576.12
**The significance of polyploidy in plant evolution.**
Amer. Nat. 1940 : **74** : 54–66.
The general characters of experimental polyploids are listed. Other important features of polyploids are their wide adaptability and their low rate of mutation. The "polyploid complex", which consists of two or more diploid species bridged by a complicated series of auto- and allo-polyploids and polyploid derivatives, is discussed at some length. It is shown that in old complexes the polyploids have in general not branched out along new evolutionary lines, but show only combinations of characters derived from the diploid ancestors. The final stages in the evolution of a polyploid complex are the disappearance of the diploid types and the reduction of the complex to one or a few relic polyploid forms. *Sequoia sempervirens* and the genera *Psilotum*, *Tmesipteris*, *Lyonothamnus* and *Fremontia* are probably such vestigial polyploid complexes.
In general, diploid members of polyploid complexes occupy the older, more stable habitats and the polyploids occupy relatively newly colonized areas or areas which have been subjected to great climatic or other environmental changes.

349. Kostoff, D. 576.356.5:576.312.34:576.12
**Evolutionary significance of chromosome length and chromosome number in plants.**
Biodynamica 1939 : No. 51 : 1–14.
This paper is similar in substance to that summarized in "Plant Breeding Abstracts", Vol. X, Abst. 7.

350. Favorsky, M. V. 576.356.5:581.04
**New polyploidy-inducing chemicals.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 71–74.
Aurantia, diphenylamine and tribromoaniline all induced root swellings on barley similar to those obtained with colchicine or acenaphthene and led to an inactivation of the spindle and to the induction of polyploidy. Nine other substances tried were ineffective in inducing polyploidy.
The above effective substances do not compare with colchicine in penetrating power. Of 30 new roots from treated plants only one consisted largely of tetraploid cells and none of the substances was effective in inducing polyploidy in a growing stem apex.
The chemical composition of the compounds tried is discussed in relation to their effectiveness.

351. Kostoff, D. 576.356.5:581.04
[**Duplication of the chromosome number (polyploidy) as a method of producing new forms of plants**].
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 29–32.
The methods of using colchicine and acenaphthene and some of the author's results are briefly described.

352. Shmuck, A. and Gusseva, A. 576.356.5:581.04
**Chemical structure of substances inducing polyploidy in plants.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 441–46.
More than 100 different carbocyclic and heterocyclic compounds were synthesized and tested to determine whether they produce an effect on various plants similar to that of colchicine

and acenaphthene. In general, the results resembled those obtained by various authors for carcinogenic substances; active hydrocarbons lose their activity on the introduction of carboxyl, hydroxyl, nitro, sulpho or amino groups into the molecule. The only exception was that of nitronaphthalene, which was very active. The position of the groups is important, e.g. α derivatives of naphthaline were incomparably more active than β-derivatives.
Cereals were found to be most readily affected by these compounds, while legumes were most resistant, though certain substances, e.g. α-naphthoate, 3-5-dibromonaphthaline and α-nitronaphthene were equally active with regard to all the plants tested. Carcinogenic substances similarly differ in their effectiveness according to the animal species tested.

353. GAVAUDAN, P. and GAVAUDAN, N. 576.356.5:581.04:576.356:633
Action de l'apiol sur la caryocinèse et la cytodiérèse chez quelques phanérogames. **(Action of apiol on karyokinesis and mitosis in certain phanerogams).**
C.R. Acad. Sci., Paris 1939 : **209** : 805–07.
As in the case of *Triticum vulgare* (cf. Abst. 356 below), treatment of *Hordeum distichon* var. *erectum* and *Cucurbita Pepo* with apiol resulted in various cytological disturbances and also the production of polyploid cells. Incidentally, it is pointed out that parsley (*Petroselinum sativum* syn. *Apium Petroselinum*) contains sufficient apiol to produce the characteristic anomalies in grains of wheat left in its vicinity to germinate.

354. NAVASHIN, M. S. and GERASSIMOVA, H. 576.356.5:581.04:581.45:581.165.72:578.08 633.913:576.356.5
**Production of polyploid plants from leaves treated with colchicine.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 948–50.
Polyploid plants of *Taraxacum kok-saghyz* were obtained by taking leaf cuttings of colchicine-treated plants. Leaves are very readily affected by colchicine treatment and frequently show polyploid sectors which can most easily be utilized by rooting leaf cuttings.
It is pointed out that this method may be applicable to many vegetatively propagated plants and sterile hybrids where seed treatment is not possible, since the possibility of rooting leaf cuttings from most plants has not been properly explored. Some hints on rooting such cuttings are given.

355. 576.356.5:581.04:633 633.51:575.127.2:576.356.5:581.04:581.481
**Use of a chemical in plant breeding.**
Science (Suppl.) 1939 : **90** : No. 2328 : p. 8; also Poona Agric. Coll. Mag. 1939 : **31** : 145–46.
Some of the work being carried out with colchicine in the United States is summarized. It is stated that J. O. Beasley in North Carolina is attempting to obtain homozygous lines from crosses between Sea Island and Upland cottons by doubling the chromosome number (using colchicine) of a haploid plant derived from a twin seed of the hybrid. The aim is to obtain a type combining the long fibre of Sea Island with the early maturity of Upland cotton.
H. H. Smith is working on similar lines on *Nicotiana*, while H. Dermen and G. M. Darrow are using colchicine in fruit breeding.

356. GAVAUDAN, P. and GAVAUDAN, N. 576.356.5:581.04:633.11
Mise en évidence sur les méristèmes radiculaires de *Triticum vulgare* de l'existence d'une propriété mito-inhibitrice commune aux divers apiols. **(Demonstration with root meristems of *T. vulgare* of the existence of a property of inhibitory action on mitosis common to various apiols).**
C.R. Soc. Biol., Paris 1939 : **131** : 998–1000.
Various anomalies in cell division following treatment of meristematic root tissue of *T. vulgare* with commercial forms of apiol were observed including the formation of diploid and tetraploid

cells and giant polyploid nuclei. The resemblance between the effects of apiol and of acenaphthene, colchicine and similar agents is pointed out, but no exact interpretation of the results is possible at the present stage of the investigation. (See also Abst. **353** above).

357. Glotov, V. 576.356.5:581.04:633.956
**Effect of colchicine from *Colchicum umbrosum* Stev. on the camphor basil.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 502–04.
Colchicine extracted from *C. umbrosum* was almost as effective in its action on camphor basil (*Ocimum canum*) as that obtained from the usual species, *C. autumnale*; the difference was due to the high content of harmful impurities in the *C. umbrosum* sample.

358. Nebel, B. R. and 576.356.5:581.04:634:575
Ruttle, M. L. 635.72:576.356.5:581.04
**Colchicine and its place in fruit breeding.**
Circ. N.Y. St. Agric. Exp. Sta. 1938 : No. 183 : Pp. 19.
The course of cell division is traced and the effects of colchicine on the nucleus is outlined. Experiments with colchicine-induced polyploidy in ornamental plants are described and it is also reported that a sterile mint hybrid (*M. aquatica* x *M. rotundifolia*) and the sterile commercial spearmint have both been rendered fertile by chromosome doubling; in these cases the essential oil content of the plant was also changed.
Special opportunities for the use of colchicine in fruit breeding are the production of tetraploid apples and pears and thence, by crossing with the diploid, new triploids; chromosome doubling in peaches, apricots and 16-chromosome plums, which would probably make possible crosses between the species; the restoration of fertility in sterile crosses between sweet and sour cherries by chromosome doubling, and work on *Rubus* and *Ribes*.
Various ways of applying colchicine are outlined.

359. Shimamura, T. 576.356.5:581.04:635
**(A cytological experiment with colchicine in plants).**
Jap. J. Genet 1939 : **15** : 158–59.
Colchicine produced in Japan has been successfully used to induce doubling of chromosomes in *Allium* and in beans, though it is not yet recommended for experiments involving strict quantitative analysis.
Possible physiological effects upon the plant as a consequence of the impurity of the Japanese product have not yet been investigated.

## BOTANY 58

360. Glinyany, N. P. 581.143.26.03:633.1:575.11
**Variations in the vegetation period.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 78–82.
Attention is called to certain irregularities observed in the earing time of spring sown winter wheat and in lines derived from a cross between spring and winter barley. Many cases were observed in which the progeny of plants which eared relatively early in the season failed to ear in the next season, and variations in the reverse direction also occurred. It is concluded that the factor responsible must be one which acts on the parent plant during the period between the end of the vernalization period and pollination. Temperature conditions are possibly responsible.

361. Dahl, A. O. 581.143.7:581.04:633.13
**A preliminary investigation of the acenaphthene response seen in certain seedlings.**
Amer. J. Bot. 1939 : **26** : p. 5s. (Abst.)
Marked swelling of the coleoptile resulted from acenaphthene treatment of *Ipomoea* and *Avena*. Experiments on *Avena* showed that treatment resulted in a lack of normally polarized

growth. Acenaphthene treatment gave results slightly different from colchicine treatment —it resulted in greater elongation and a peculiar curvature of the coleoptile, and in a lesser degree of swelling.

362. Skovsted, A. 581.481:576.356
**Cytological studies in twin plants.**
C.R. Lab. Carlsberg, Copenhagen 1939 : **22** : Sér. Physiol. : 427–46.

Twin plants are reported and described in species of *Agrostis*, *Alopecurus*, *Avena*, *Brassica*, *Dactylis*, *Daucus*, *Festuca*, *Linum*, *Lolium*, *Lotus*, *Medicago*, *Phleum*, *Poa*, *Pseudotsuga*, *Trifolium* and *Zinnia*. Of 61 sets of twins examined cytologically, 39 had the same chromosome numbers and were probably normal diploids. The remaining 22 pairs of twins could be placed in five groups: haploid-diploid, diploid-triploid (or hypertriploid), triploid-triploid, and two aberrant groups in which there were aneuploid differences in chromosome number ($2n = 33$ in both members of one set of *Medicago sativa*, $2n = 31$ and $2n = 32$ in another pair) or chromosome fragmentation (a fragment in both plants of a set of *Trifolium pratense*, and in the 84-chromosome hyper-triploid partner of a set of *Poa pratensis*, the other member having $2n = 50$).

It was shown that twins greatly differing in vigour frequently had equal chromosome numbers, whereas pairs similar in vigour not infrequently had different chromosome numbers; in short, it was impossible to determine which pairs were cytologically interesting by observing the plant type. Differences in vigour between diploid pairs could be due to genetic segregation but were more often dependent on deficient nutrition of the embryos.

It is shown that twins in plants, as in animals, may arise either from cleavage of a single embryo or from two embryos.

## PLANT DISEASES 632

363. Bowden, W. M. 632.111:576.356.5:581.9
**Polyploidy and winter hardiness relationships in the flowering plants with reference to karyogeographical problems.**
Amer. J. Bot. 1939 : **26** : p. 5s. (Abst.)

Some 100 species and varieties have so far been studied in an attempt to trace a relationship between chromosome number, the degree of winter-hardiness and the geographical distribution of plants. The evidence indicates that the degree of winter-hardiness depends on the genetic constitution of the individual and not on chromosome number; the whole range of variability in hardiness may be found in either diploid or polyploid species.

364. Bjaanes, M. 632.4–1.521.6:633
Resistensforedling. (**Breeding for resistance**).
Tidsskr. Norske Landbr. 1939 : **46** : 512–22.

A comprehensive survey is made of the problems involved in breeding crop plants for resistance to disease, illustrated mainly by descriptions of German achievements as regards resistance to rust and mildew in cereals. Methods and their value and the special problem of physiological races are discussed.

In conclusion the justification for costly equipment in such research is touched upon.

The author points out the need for a study of the physiological races of economically important parasitic fungi in Norway and for co-operation between the expert on such fungi and the various breeders. The classification of the numerous varieties, strains and forms of indigenous and foreign crop plants in the different experiment stations in Norway is recommended in order that such material should be available for breeders, if required; German organization in this respect is commended and especially the establishment of a world collection and of a variety register which is supplied free to breeders on request.

365. 632.421.9:575.242:575.11
DIMOCK, A. W. 575.242:575.123:576.354.4
**Studies on ascospore variants of *Hypomyces Ipomoeae*.**
Mycologia 1939 : **31** : 709–27.
Genetic studies on a number of mutant forms of *H. ipomoeae* are reported. Reversion of many of these mutants to the normal type was observed. The observations strongly suggest that gene mutation is favoured during meiosis, particularly in heterozygotes.

366. YAMAMOTO, Y. 632.422.3:575.114
**(Genetical investigations on Saccharomycetes. I. Segregations in *Saccharomyces Saké* Yabe).**
Bot. Mag., Tokyo 1939 : **53** : 449–59.
Spores were isolated from a single ascus of two varieties of *S. Saké.* Most of them developed without conjugation to form haploid cells, but one of them became diploid through conjugation of sister cells.
Genetic segregations of morphological and physiological characters of colonies were observed when all the spores were isolated from a single ascus of one of the varieties, but there were no such segregations in mono-spore cultures of the other variety. Segregation has also been observed in the next generation. The probable autopolyploid nature of this yeast is discussed.

367. TYLER, L. J. 632.452:575.11:575.242:575.12
**Variation in *Sphacelotheca sorghi* (Link) Clinton.**
Tech. Bull. Minn. Agric. Exp. Sta. 1938 : No. 133 : Pp. 48.
An account of extensive genetic studies on *S. sorghi*; the inheritance of sex and of various cultural characters, mutation rates and other topics are dealt with.

368. WEINDLING, R. and
ARMSTRONG, G. M. 632.484:633.51–1.521.6:578.08
**A water-culture infection method used in the study of *Fusarium* wilt of cotton.**
Phytopathology 1939 : **29** : p. 23. (Abst.)
A method of testing the resistance of cotton seedlings to *Fusarium* wilt is briefly outlined. It is similar to that referred to in Abst. 369 below.

369. HARRISON, A. L. 632.484:635.64–1.521.6:578.08
**A method for testing resistance of tomatoes to *Fusarium* wilt.**
Phytopathology 1940 : **30** : 86–87. (Abst.).
The method described is essentially similar to that summarized in Abst. 368 above.

370. WELLMAN, F. L. 632.484:635.64–1.521.6:578.08
**A technique for studying host resistance and pathogenicity in tomato *Fusarium* wilt.**
Phytopathology 1939 : **29** : 945–56.
Tomato seedlings were grown in sterilized soil for from four to six weeks in a warm greenhouse and the roots were then washed and dipped in an inoculum made from *Fusarium* cultures grown on a liquid medium. After transplanting the seedlings were grown at a controlled temperature and their resistance to the disease could be determined in about one week. A numerical system for evaluating the severity of the symptoms is described.

## CEREALS 633.1

371. 633.1–1.524(49.2)
HAAN, H. DE 633:581.9(49.2)
Rassenstatistiek. Overzicht van de verschuivingen in het rassensortiment.
**(The distribution of varieties. Changes in the varietal composition).**
Landbouwk. Tijdschr., Wageningen 1939 : **51** : 809–43.
The author presents the results of a study of the varietal trends and geographical distribution

of the varieties of various cereals and other crops in Holland from 1931–38. In addition to the historical importance of such data, their bearing on J. K. Groenewolt's paper (cf. Abst. 372) on the role of plant breeding in increasing yield is pointed out.
In the writer's opinion the data collected by the Seed Inspection Service cannot form a valid basis for a study such as has been here carried out.
A bibliography of all relevant publications known to the author is appended.
The paper was followed by an animated discussion.

372. 633.1–1.557:575(49.2)
633:575:581.6
Groenewolt, J. K.
Opbrengst en kwaliteit. **(Yield and quality).**
Landbouwk. Tijdschr., Wageningen 1939 : **51** : 843–62.

Examining the factors conducive to high yield in wheat, barley, oats, and also in peas, and comparing old and new varieties, the author concludes that (on clay soils) high productivity need not be correlated with inferior reliability in yield. Statistics are cited showing that the new selection of strains chosen in the period from 1931–38 has resulted in an average increase of 3·5 per cent in yield for the cereals and of 8 per cent for peas.
Speculating on future progress in yield improvement, the writer holds that in time the Juliana wheat should be surpassed. A cross between Juliana and Carsten V seems promising and may ultimately result in a winter-hardy strain with the same size of grain as Juliana but with a higher number of tillers. A form derived from this cross is at present being tested by Dr. Mansholt. As regards barley, the writer believes that if it were possible to produce a variety with the total yield (grain + straw) of Spratt-Archer and the grain/straw ratio of Kenia, the new form would give 14 per cent more grain than either Abed Kenia or Spratt-Archer. With reference to rye the writer thinks that Petkus could be surpassed by selecting primarily for a high number of tillers—a character for which Petkus is not particularly remarkable.
The desirability of developing new forms is also demonstrated for other crops, such as turnips and also fodder beets; in the latter case a combination of the desirable features of Groenkragen and the Barres or Eckendorfer types could probably be easily attained.
While it is hoped that in breeding such new types the physiological investigations of Boonstra and van de Sande Bakhuizen may soon be capable of practical application, due recognition must be given to the "flair" of the breeder and the new prospects opened up by the artificial induction of mutations.
In discussing the difficulties of improving the quality of crops attention is directed to the potential importance to the farmer of features such as fibre content in varieties of oats. Barley improvement is considered from the standpoint of the various requirements and the types needed to meet them; and co-operation between agriculture, trade and industry is shown to be essential to progress in breeding better crops. An increase of 10 per cent in the "harvesting value" (i.e., yield and quality combined) is in the writer's opinion not impossible with the knowledge at present available to breeders.
In the active discussion following this paper the value of the system adopted of recent years in Holland whereby specific subjects are chosen for co-operative research was again mentioned.

## WHEAT 633.11

373. Ciferri, R. and
Giglioli, R. G. 633.11(63)
La cerealicoltura in Africa Orientale. IV. Caratteristiche dei gruppi minori di frumenti etiopici e loro "formulazione." **(Cereal cultivation in East Africa. IV. Characteristics of the smaller groups of Ethiopian wheats and a "formula" for them).**
Ital. Agric. 1939 : **76** : 837–44.

In continuation of the earlier studies (cf. "Plant Breeding Abstracts", Vol. IX, Absts. 1027 and 1428) varietal formulae are given for all the forms found in all the different species, showing to which botanical varieties they belong (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1028).

374. Strampelli, N. 633.11:575(45)
Frumento "Tiriamo diritto" ("T.D."). [**The wheat "Tiriamo diritto" ("T.D.")** .
Ann. Tec. Agr., Roma 1939 : **12** : 1–7.
The new variety Tiriamo diritto (Fire Ahead) has been obtained from the cross Ardito x Akagomughi x (Wilhelmina x Rieti). It has exceeded all other varieties in yield at Rieti, its yields having been sometimes as high as 63 quintals per ha. Its grain is of high quality and the variety is early (maturing a few days after Mentana), tolerant of very unfavourable growth conditions and resistant to rust and many other diseases.

375. Kiseleva, A. K. 633.11:575(47)
(**A new variety of winter wheat "Velutinum 081").**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : p. 15.
The new wheat is a selection from a white eared, awnless local strain; it is felted, and excels the standards in baking quality, yield, resistance to frost, drought and smuts; further features to recommend it are its very uniform height and good standing capacity.

376. Mirzojan, A. I. 633.11:575(47)
(**New promising varieties of spring wheat in the northern region of the U.S.S.R. excluding the Black Soil Zone).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : 10–12.
Among the new imported and locally produced wheats one of the most promising is Tulun 70 B/8, a selection from Preston. It has greatly excelled Lutescens 062 in yield and is 1–2 days earlier in maturity; it is superior to 062 also in resistance to lodging, shedding, *Ustilago* and brown rust.
Tulun 3 A/32, a selection from Huron, is also promising; it ripens 3–4 days after Garnet and is resistant to lodging, *Ustilago* and brown rust.

377. Plotnikov, N. Ja. 633.11:575(47)
(**Promising varieties of spring wheat for the Transural, Western Siberia and Kazakhstan).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 23–25.
Milturum C-553 was produced by crossing Milturum 321 with Kitchener. It has short, almost spherical grains, has exceeded the yield of the standard, Milturum 321, by 0·2–7·0 centners per ha. and has quite unusually strong straw. Resistance to *Ustilago* and to shedding are among its other assets.
The variety Smena, a selection from local Omsk wheat, has exceeded the standard Caesium 111 in yield, earliness and standing capacity; it is moderately disease resistant.

378. Pokhil', I. F. 633.11:575(47)
[**A new variety of winter wheat ("Lutescens 09")**].
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : p. 16.
Produced from a cross between Ukrainka and a local winter wheat T 400, the new wheat is early, fairly hardy, less susceptible to drought and frost than Ukrainka and higher in yield.

379. Pustovoit, E. S. 633.11:575(47)
(**Work on the improvement of the winter wheat Buivolinka).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 40–41.
The variety Buivolinka is equal to Kooperatorka in earliness and surpasses it in frost and drought resistance. By individual plant selection lines have been produced which exceed Kooperatorka by 20–25 per cent in yield and at least one of them is resistant to *Tilletia*.

380. Savitskii, M. S. 633.11:575(47)
**(New and promising varieties of winter and spring wheats at the Soviet Agricultural Exhibition).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8: 5–9.
Brief descriptions are given of the best varieties, with indications of their origin.

381. Sergeev, V. Z. and 633.11:575(47)
Starkov, A. A. 633.11–2–1.521.6
**A new promising variety of spring soft wheat, Pionerka (D-SP-21-44).**
Sotsialističeskoe Zernovoe Khozjaistvo (Socialistic Grain Farming) Saratov 1939 : No. 4 : 118–23.
The following claims are made for this new variety which was produced from a sample obtained from the United States of a wheat derived from a (Marquis x Iumillo) x (Kanred x Marquis) cross: superior yield; resistance to Hessian fly, rust, smut (*Ustilago*), shedding and lodging; good baking qualities and loaf volume.
The variety is now undergoing trials in the Rostov district. Morphologically it is classed with the botanical variety Lutescens.

382. Clark, J. A. 633.11:575(73+71)
**Registration of improved wheat varieties, XIII.**
J. Amer. Soc. Agron. 1940 : **32** : 72–75.
Four wheat varieties, Wabash, Renown, Coronation and Regent, were registered in 1939 by the U.S. Department of Agriculture in co-operation with the American Society of Agronomy. Renown and Coronation have already been referred to in "Plant Breeding Abstracts", Vol. VIII, Abst. 1030, and Renown and Regent in Vol. IX, Abst. 915. Wabash was selected from a natural hybrid at the Purdue Agricultural Experiment Station, Indiana. It is a soft red winter wheat superior to standard varieties in yield, winter-hardiness and resistance to leaf rust and mosaic. It was released to growers in 1938.

383. Boerger, A. 633.11:575(89)
Weizenzüchtung in Uruguay. **(Wheat breeding in Uruguay).**
Züchter 1939 : **11** : 265–77.
The unusual variability of the weather conditions is the main condition in determining whether or not a variety is suitable for cultivation in Uruguay. Reference is made to the varieties already described (cf. "Plant Breeding Abstracts", Vol. VIII, Absts 1486–7) and to two early maturing varieties—a further member of the Litoral group, Litoral Precoz, and an awnless felted form, Pelón Plateado, from the cross Florence x 38 M.A.; the latter has given the highest yields of all the varieties tested. Trials carried out in all representative parts of the country showed that owing to the peculiar climatic conditions of Uruguay none of the Argentine wheats gave results that compared with the new group of varieties produced in Uruguay.
Figures are given indicating how the cultivation of the new wheats has led to an increase in profit by the farmers and in the area of wheat under cultivation.

384. Mirzojan, A. I. 633.11:575"793"(47)
**(New early varieties of spring wheat for the forest and sub-forest regions of Siberia).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 25–27.
Several new wheat varieties maturing about three days earlier than Garnet have been produced. These include Severjanka, from a cross between Marquis and a local Siberian wheat, slightly inferior to Garnet in yield; GDS-11, from Marquis x Tulun 85 14; Udarnitsa 22 h–9 and Tulun 14 -h 64, superior in baking quality. All except the first have exceeded Garnet in yield and all are resistant to lodging and shedding and moderately disease resistant.

385. ALMEIDA, J. M. DE 633.11:575.11:581.46
Hereditariedade do carácter aristado dos trigos. (**Inheritance of awning in wheats**).
Agron. Lusitana 1939 : **1** : 327–51.
The results of a number of crosses between awned and awnless wheats are reported. Monohybrid ratios were observed in some such crosses, dihybrid in others; in Lin Calel x Vogtländer Braun seven or more gene pairs affecting the awn length of the awned segregates were operative. The length of the awnlets in the intermediate and non-bearded segregates on the other hand seemed to be inherited on a bifactorial basis. Semi-awned forms appeared in the progeny of some crosses between two awnless forms and the $F_2$ and $F_3$ of such crosses showed the precise length of the awnlets to be determined by two gene pairs.

386. MATSUMURA, S. 633.11:575.127.2:576.356
20jährige zytogenetische Untersuchung des pentaploiden Weizenbastards zwischen Emmer- und Dinkelreihen. (**Twenty years' cytogenetic investigations of the pentaploid wheat hybrids between the tetraploid and hexaploid series**).
Züchter 1939 : **11** : 289–301.
A survey is given of the literature of the subject, especially by Kihara and his colleagues. Among unpublished work referred to is the observation of the author that the pollen of *Triticum Spelta* germinates more readily than *T. polonicum* pollen on the stigma of *T. polonicum*, *T. Spelta* and the hybrid between them. Of the hybrid pollen grains the larger (presumably those with the higher chromosome numbers) germinated better than the smaller.

387. TSCHERMAK-SEYSENEGG, E. VON 633.11:575.127.5:581.163
Über muttergleiche Scheinbastarde (hybridogene Parthenogenesis). [**Pseudohybrids of maternal type (parthenogenesis resulting from hybridization)**].
Züchter 1939 : **11** : 337–41.
By pollination of emasculated plants of winter wheat and winter barley with grass pollen seed setting often resulted and mature progeny were obtained, all of which however entirely resembled the maternal forms. Similar results were obtained when barley hybrids were pollinated with rye and with pollen from certain wheat hybrids and even a spring wheat when pollinated with *Lilium candidum*. The method is thought to be of possible value in obtaining progeny from self-sterile interspecific hybrids.
A further case is mentioned where the embryo appears to be maternal but the endosperm to be hybrid in a seed arising from pollination of blue grained wheat with *Lolium italicum*.

388. SEARS, E. R. 633.11:575.127.5:633.11*Aegilops*:575.113.7
**Monofactorially conditioned inviability of an intergeneric hybrid in the Triticinae.**
Genetics 1940 : **25** : p. 134. (Abst.).
*Aegilops umbellulata* x *Triticum monococcum* hybrids die at an early growth stage, whereas *A. umbellulata* x *T. aegilipoides* hybrids are viable. Certain $F_4$ and $F_5$ derivatives of *T. monococcum* x *T. aegilopoides* also produced viable hybrids with *A. umbellulata*, and genetical studies with these forms have indicated that *T. monococcum* carries a single gene which has a dominant lethal effect whenever it is combined with the genom of *A. umbellulata*, this gene being absent in *T. aegilopoides*, a species very nearly related to *T. monococcum*.

389. KUPRIJANOV, S. I. and SUDNOV, P. E. 633.11:575.127.5:633.14:581.143.26.03 633.11–2.111–1.521.6
[**Nature of the development of secondary shoots in A. I. Deržavin's wheat (perennial wheat-rye hybrid)**].
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 33–37.
The stems that form after the second crop has been cut (for hay) may or may not survive the winter. Those that do are the stems arising from buds that have not completed the

thermo-stage of vernalization and by selecting such forms as have the maximum number of these stems an increase in winter-hardiness can be effected, together with an increase of yield of the second year's crop.

390. Murav'ev, P. A. 633.11:575.127.5:633.289:664.641.016
**(The grain quality of certain annual *Triticum Agropyron* hybrids of N. V. Tzitzin and of A. I. Deržavin's perennial wheat).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 22–24.

The grain properties of a number of the annual hybrids are described. Some of them are of good quality, but their bread is not superior to that from the best standard wheat varieties. The perennial hybrid produced bread of inferior quality, though excellent in flavour.

391. 633.11:575.129:581.04
Zhebrak, A. R. 633.11:576.16
**Amphidiploids of hard wheat and einkorn produced through colchicine treatment.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 53–55.

A chimerical plant with an amphidiploid sector was obtained by treating $F_1$ seed of *Triticum durum* x *T. monococcum* with colchicine. From this plant fertile amphidiploid progeny have been raised.

The author considers it likely that the 42-chromosome wheats arose in this way through chromosome doubling in a hybrid between 14- and 28-chromosome wheats.

392. Zhebrak, A. R. 633.11:575.129:581.04
**Production of amphidiploid of *Tr. durum* x *Tr. Timopheevi.***
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 56–59.

A plant with a fertile amphidiploid sector was produced by colchicine treatment of $F_1$ seed of *Triticum durum* x *T. Timopheevi*. In many ways this amphidiploid was intermediate between the two parents, though it showed the usual polyploid features of larger cell size, thicker, darker green leaves, etc. Like the *T. Timopheevi* parent, it was resistant to *Erysiphe graminis*; its reaction to other diseases and pests is not yet known.

393. Šulyndin, A. F. 633.11:575.183
**(On the question of the selection of mother plants in hybridization).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : 7–10.

Differences were observed in the $F_2$ populations of reciprocal crosses in respect of survival, time of earing and of maturity and hence in yield of grain, the results being consistently in favour of the combinations in which the form most adapted to local growth conditions was used as maternal parent.

394. Love, R. M. 633.11:575.242:576.356.2:575.12
**A cytologically deficient speltoid of hybrid origin.**
Genetics 1940 : **25** : p. 126. (Abst.).

Three speltoid plants found in the $F_2$ of the wheat cross Huron x R.L.1005 segregated in the next generation into 20 normal: 16 speltoid. These plants had 21 bivalents but in the case of the speltoid plants only, one of the bivalents was heteromorphic, indicating that the speltoid character was determined by a chromosomal deficiency. Such deficiencies are specially likely to arise in hybrids, owing to breakage at the attachment region in unpaired chromosomes and to fragmentation due to crossing-over in inverted segments. The *A* series speltoids may have deficiencies caused by the latter mechanism and too small to be detected cytologically.

395. Menabde, V. L. and
Scharaschidze, G. I. 633.11:576.16:576.356.5:575.242
**(Contributions to the knowledge of Georgian wheats).**
Acad. Sci. U.R.S.S. Sect. Georg. Inst. Bot. Tphilisiense 1938 : Fasc. 4 : Pp. 18.

Cytological examination of the new wheat species of Georgia, *Triticum Macha*, has shown the majority of forms to have a somatic chromosome number of $2n = 42$; some forms however had $2n = 28$. The constancy of these numbers was confirmed over a number of generations. The small group of tetraploid forms were separated into *T. dicoccum* ssp. *georgicum* Dek. et Men. In morphological features the two groups are almost identical.

Descriptions, in Russian and Latin, are given of a number of botanical varieties of *T. Macha* not previously described, together with a number of illustrations and a key to the determination of the varieties.

Great variation occurs in such characters as awning, awned, awnless, intermediate and inflatum forms being found. In other features too the species combines characters associated with both the tetraploid and hexaploid wheats and is thought to be one of the ancestral species of the present-day wheats. *T. dicoccum* ssp. *georgicum* for instance seems to have arisen from it by mutation. Georgia is regarded as a primary centre of origin of the cultivated wheats.

396. Levitsky, G. A.,
Sizova, M. A. and
Poddubnaja-Arnoldi, V. A. 633.11:576.312.34
**Comparative morphology of the chromosomes in wheat.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 142–45.

The chromosome morphology of *Triticum monococcum*, *T. polonicum* and *T. vulgare* was studied, and the idiograms are shown. Fourteen chromosomes of *T. vulgare* (presumed to be the A and B genoms) closely resemble 14 of *T. polonicum*. It was not easy to determine which seven of these 14 chromosomes correspond with the seven in *T. monococcum* (the A genom), but a provisional classification was made.

It appears that three chromosome pairs of the A genom correspond closely to three of the B genoms, the other four being markedly different. None of the chromosomes of the D genom resembles any in the A or B genom.

397. Camara, A. and 633.11:576.312.34:576.16
Coutinho, L. A. 633.11:576.356.2:576.16
Citologia dos trigos tetraploides. **(Cytology of the tetraploid wheats).**
Agron. Lusitana 1939 : **1** : 268–314.

The authors are of the opinion that efforts to improve the local strains of *Triticum durum* and *T. turgidum* are more profitable than introduction of even the best forms of bread wheat from abroad, and have undertaken an extensive study of their cytology. Measurements were made of the individual chromosomes, on the basis of which the idiograms are given for the above two species and also for *T. Timopheevi*, *T. polonicum*, *T. dicoccum*, *T. persicum*, *T. orientale* and *T. dicoccoides*. Considerable variation was evident from species to species, indicating that they have suffered various structural changes in the course of evolution. The position of the secondary constrictions however has remained relatively constant.

Little similarity was observed between the idiogram of *T. durum* and that of *T. turgidum* and *T. orientale* or between *T. Timopheevi* and *T. dicoccoides*, though such would have been expected on genetical grounds.

Observations of meiosis in hybrids between different races within the species in *T. durum* and *T. turgidum* showed the presence of unpaired chromosomes and also of multivalent associations. The same was observed in hybrids of *T. turgidum* x *T. durum* and other interspecific combinations, in many of which anaphase bridges were formed. These are an indication of the existence of structural interchanges, which have in all probability had a definite evolutionary role. The bridges are also thought to be responsible for certain phenomena of "shift" observed in such crosses.

398. Sizova, M. A. 633.11:576.356.2
**Structural chromosome alterations in *Triticum durum*.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 75–77.

Crosses between *Triticum durum* s.sp. *abyssinicum* var. *gondaricum* and forms of *T. durum* s.sp. *expansum* proved to be heterozygous for a reciprocal interchange, the ring of four chromosomes being associated with the nucleolus. This interchange was detectable in somatic cells, since the four chromosomes with secondary constrictions were involved and the interchange led to a conspicuous reduction in the length of one arm of one of them. Structural heterozygotes and the two types of homozygotes could all be distinguished from their somatic complements.

Similar shortening of a chromosome with a secondary constriction was observed in *T. durum* s.sp. *abyssinicum* vars. *axumicum*, *rubromuticum* and *taborense*, but vars. *Schimperi* and *arrasecta* differed from var. *gondaricum* in this respect.

399. Kondo, M. and Kasahara, Y. 633.11:578.088.1
**(Variety-distinction of wheat and barley by means of phenol coloration).**
Proc. Crop. Sci. Soc. Japan 1939 : **11** : 230–52.

Varietal determinations of wheat and barley were successfully made by colour gradations of the reaction of the grain to tincture of guaiacum, paracresol, di-methyl-aniline and benzidine, as well as phenol. The paracresol reaction is particularly rapid. The phenol method is more effective with wheat than with barley.

400. Sorokin, K. A. 633.11:581.162.32
**(Distribution of wheat pollen by the wind).**
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 16 : 8–15.

Pollen grains were detected on vaselined slides at a distance of 75 m. and 42 per cent of the winter wheat florets emasculated and left at that distance were pollinated under certain conditions. Pollen of spring wheat was effective up to a distance of over 300 m.

401. Ciferri, R. and Giglioli, R. G. 633.11–1.524.4(67.73)
La cerealicoltura in Africa Orientale. III. I frumenti volgari e compatti.
**(Cereal cultivation in Italian East Africa. III. *Triticum vulgare* and *T. compactum*).**
Ital. Agric. 1939 : **76** : 765–74.

Sixty botanical varieties of *T. vulgare* have been found and sixteen of *T. compactum*. Not a few varieties however appeared to be intermediate between the two species and some showed affinities with *T. pyramidale*; many hybrids between *T. vulgare* and *T. durum* occurred. Only the *T. vulgare* varieties *graecum*, *erythrospermum* and *ferrugineum* occur at all frequently. All are exceedingly early, fulfilling the period from sprouting to ear emergence in 48 to 54 days; they are relatively resistant to *Puccinia glumarum* and *P. triticina*.

402. Šul'ga, M. S. 633.11–2–1.521.6
**(The question of breeding winter and spring wheats resistant to fungous diseases and pests).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 6 : 11–14.

Data are given illustrating the advantage in yield gained by the production of varieties of wheat resistant to brown rust, Hessian fly and smut, some of the most promising new varieties being enumerated.

403. Luk'janjuk, V. I. 633.11–2–1.521.6:575(47)
**(New promising variety of spring wheat).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 30–31.
A variety referred to as Pionerka ["Pioneeress"], obtained from the U.S.A., though in its home country it has not been a great success, has proved highly promising in certain parts of the Soviet Union (Rostov, Krasnodar) on account of its extreme resistance to all three rusts, bunt, smut and Hessian fly, its excellent baking quality and high yield.

404. Palienko, V. I. 633.11–2–1.521.6:575(47)
**(New hybrid varieties of winter wheat from the Rostov Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 6 : p. 33.
By crossing the variety Ferrugineum 59, characterized by winter-hardiness, drought resistance and good baking quality, with Zarja, a high yielding wheat resistant to lodging and brown rust, two promising new varieties have been obtained with large vitreous grains, combined with resistance to drought, fungous diseases, lodging and shedding. They have exceeded the standards Hostianum 0237 and Ukrainka 0246 by 8 centners per hectare in yield (cf. Abst. 381 above).

405. Builin, D. P. and
Builina, E. S. 633.11–2.111–1.521.6:575(47)
**(Breeding winter wheat in the central Volga basin).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 27–30.
By removing the snow covering from the breeding plots it has been possible to select some very hardy forms of the wheat Kuznečanka, all of which however were somewhat later in maturity; they varied in some degree and further selection is being exercised for earliness.
Fourteen combinations of parental varieties that have yielded frost-resistant progeny are enumerated and from these, 20 lines combining hardiness equal to the above with early maturity have been obtained. The best of them have exceeded the standard Lutescens 1060/10 in yield and are described.
Special mention is made of certain crosses in which the progeny have been distinctly more frost-resistant than either of the parent forms.
The hardy forms obtained are now being crossed with varieties of good baking quality to combine the two characters.

406. 633.11–2.452–1.521.6:575.127.2:576.354.4
Guard, A. T. 633.11:575.129:633.14–2.452–1.521.6
**Studies on cytology and resistance to leaf rust of some interspecific and intergeneric hybrids of wheat.**
Amer. J. Bot. 1938 : **25** : 478–80.
Crosses were made between *Triticum vulgare* (variety Chinese) and *T. dicoccum* (variety Vernal), *Secale cereale* (variety Abbruzzes) and *S. montanum*. Plants were tested in the greenhouse for resistance to race 65 of *Puccinia triticina*.
The $F_1$ hybrid with Vernal showed variable resistance to the rust. At meiosis $14_{II}$ and $7_I$ were observed. Twenty-four lines selected in $F_3$ were studied in $F_4$ and $F_5$. Of these, seven had $14_{II}$ and were rust-resistant and 17 had $21_{II}$. Of the latter, 11 were resistant and six highly susceptible to the rust.
An amphidiploid derivative of Chinese wheat x Abbruzzes rye showed $28_{II}$ at meiosis and only very rare univalents. From 0 to 4 lagging chromosomes (usually two) were found at anaphase and there were occasional micronuclei in the microspores. Fertility ranged from 5 to 75 per cent, and the form was highly resistant to leaf rust.
Fifteen $F_1$ plants of Chinese wheat x *S. montanum* were studied. These two forms crossed readily but the $F_1$ was sterile. Anthers were abortive at an early stage or developed but failed to dehisce. There was rarely one bivalent at diakinesis; usually there were 28 univalents

which moved to the poles without dividing. Later stages were very irregular. These plants were highly resistant to leaf rust.

407. Gorlač, A. A. 633.11–2.452–1.521.6:578.08
**(A new method of selecting wheat for resistance to brown rust).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 6 : p. 14.
By sowing winter wheats unvernalized in the spring a very strong rust attack is produced and the method is recommended for testing breeding material.

408. Pisarev, V. E. and Malinovskaja, E. S. 633.11–2.484–1.521.6:575(47)
**(Breeding spring wheat for resistance to *Fusarium*).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 13–18.
Infection with *Fusarium* was found to be the cause of reduced germination in a number of varieties when sown in the open. The form responsible seems to be *F. avenaceum* and certain varieties resistant to it are indicated. By mass selection in a hybrid population from the cross Local Norwegian x Blue Stem a form, known as Hybrid 170, with greatly increased resistance has been produced and similar resistant hybrids have been obtained in certain other crosses involving the resistant parents Milturum 321, Tulun 81 4 and Tulun 120/32.

409. Česnokov, P. G. 633.11–2.7–1.521.6:575(47)
**Spring wheats resistant to Hessian fly (*Phytophaga destructor* Say.)].**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 12–13.
Artificial tests have been conducted with a great number of varieties, and the most resistant varieties are enumerated; some other varieties are indicated which, while being heavily infested, suffered little damage from the attack and appear to be tolerant. *Triticum vulgare* varieties from the Mediterranean were the most resistant of any; the most promising were Erythrospermum 78 01, Erythrospermum 82 02, Albocaesium 065 and Lutescens 1163; also the Argentine varieties San Martin and Triunfo.

410. Bujanov, Ju. M. 633.11:664.641.016:578.08
**(The accuracy of technological investigations in breeding wheat).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 18–19.
Data are given showing the coefficients of variation of different components that are determined in estimating the baking quality of a variety. Such features as salt content of the grain, flour extraction, loaf volume, porosity, colour and constitution of crust are the most accurate. Comparing the results with those reported in the U.S.A. it is concluded that the Russian methods are not inferior in accuracy.

411. Mori, H. 633.11:664.641.016:578.08
**(On the method of testing the quality of wheat flour).**
Proc. Crop. Sci. Soc. Japan 1939 : **11** : 112–23.
A note on a new apparatus devised by the author for testing the quality of wheat dough and its elasticity and extensibility in particular.

## BUCKWHEAT 633.12

412. Saltykovskii, A. I. 633.12–2.3–1.521.6
**(Immunity of buckwheat to bacteria).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 25–27.
Many of the varieties from the Leningrad and neighbouring zones are resistant, in contrast to the forms from further south, and by selection this resistance can be very materially increased.

413. STANTON, T. R. 633.13:575(73)

**Registration of varieties and strains of oats, IX.**

J. Amer. Soc. Agron. 1940 : **32** : 76–82.

Five new varieties, Boone, Hancock, Marion, Fulwin and Tennex, were registered in 1939 by the U.S. Department of Agriculture in co-operation with the American Society of Agronomy.

Boone is an early yellow oat bred from the cross Victoria x Richland (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 713). It has short, stiff straw, plump kernels, early maturity, high yield and quality and high resistance to nearly all the physiological races of stem rust, crown rust and the smuts. It will be distributed in 1940.

Hancock was derived from a Markton x Rainbow cross (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 227). It is also an early yellow variety and has tall, very stiff straw, good quality and resistance to stem rust and to most of the physiological races of loose and covered smut. It is specially suited as a nurse crop variety for use with sweet clover.

Marion is another derivative of a Markton x Rainbow cross. It is a white oat obtained by crossing two yellow varieties. It is of early maturity, has high yield, high test weight, stiff straw and resistance to stem rust and smut as well as to certain races of crown rust. It is of excellent quality for milling and feeding.

Fulwin, a red oat, is a re-selection from Fulghum. It is winter-hardy and high yielding. It is specially suited for late sowing after the maize harvest in Tennessee.

Tennex is a sister strain of Fulwin and differs only in having darker green seedling leaves and in ripening 7–10 days earlier.

414. HAYES, H. K.,
MOORE, M. B. and 633.13:575.127.2
STAKMAN, E. C. 633.13-2.45–1.521.6

**Studies of inheritance in crosses between Bond, *Avena byzantina*, and varieties of *A. sativa*.**

Tech. Bull. Minn. Agric. Exp. Sta. 1939 : No. 137 : Pp. 38.

Correlated studies of inheritance in crosses between Bond and the varieties Anthony, Iogold, Rainbow, Double Cross A and Double Cross B are reported in this bulletin. Double Cross A and Double Cross B, resistant to both species of smut and moderately resistant to some races of stem rust, are derivatives of the cross (Minota x White Russian) x Black Mesdag.

Resistance to crown rust was dominant in all the crosses; a 3 : 1 ratio was obtained in the $F_2$ of the cross Bond x Rainbow and in the other crosses a 9 : 7 ratio was obtained. Resistance to stem rust was dominant and due to a single gene.

In the cross between Bond and Double Cross A, both varieties resistant to smut, susceptible lines appeared in the $F_3$ indicating that the parents had different genes for resistance. Bond was found to differ from Iogold and Anthony by a single major gene and minor modifiers.

The *sativa* type of spikelet disarticulation was dominant over the *byzantina* type, $F_2$ results indicating a single gene difference.

The type of floret disjunction in crosses between Bond and the double cross parents was also determined by a single gene but in other crosses at least two gene pairs were concerned.

The lower number of basal hairs characteristic of the *sativa* varieties was dominent over the greater number of the Bond parent. The $F_2$ ratio approached 3 : 1.

No factorial analysis was made of the segregation for the characters awn development, plant vigour and plumpness of seed owing to the complexity of the results.

There was no indication of linkage between any of the genes for resistance to stem or crown rust and smuts and the other characters studied.

The characters that differentiate *A. byzantina* from *A. sativa* were strongly linked. Spikelet disarticulation and basal hair development were linked with a cross-over value of 2·7 per cent. In the crosses of Bond with the two double cross parents one of the genes for floret disjunction and the major gene for basal hair development were linked with the cross-over value of 24 per cent. Spikelet disarticulation and floret disjunction were linked in the same crosses with the recombination value of 25·7 per cent.

It is concluded that it should be relatively simple to combine resistance to crown rust, stem rust and the smuts with the desirable characters of the *A. sativa* varieties and the plump grain of Bond. G. P. C.

415. 633.13:575.127.2:576.354.4
633.13:576.356.5
NISHIYAMA, I.
**Cytogenetical studies in *Avena*. II. On the progenies of pentaploid *Avena* hybrids. III. Experimentally produced eu- and hyperhexaploid aberrants in oats.**
Cytologia, Tokyo 1939 : **10** : 88–100, 101–04.

Pentaploid *Avena* hybrids are highly sterile, but selfed and back-crossed progenies of the cross *A. barbata* x *A. fatua* were obtained and studied through several generations. Chromosome number was found to range between $2n = 42$ and $2n = 67$. Metaphase configurations varied greatly. Trivalents and multivalents were frequent in some plants. Hyperhexaploid plants with $22_{II}$, $24_{II}$ and $25_{II}$ were found in the back-crossed families and there was an octoploid with $28_{II}$ in the $F_4$. Of these only the $22_{II}$ form bred true; other constant types were found with $21_{II}$ and, unexpectedly, with $7_{II}$. Hybrid progenies varied widely in fertility and vigour. Plants with $21_{II}$ or $22_{II}$ showed high, and plants with $24_{II}$ or $25_{II}$ low fertility. All the hyperhexaploids were of semi-dwarf habit.

In the second paper the constitution of three of the above true-breeding forms, two with $21_{II}$ and one with $22_{II}$, was examined by crossing them *inter se* and with *A. fatua*. One of the 42-chromosome forms gave $21_{II}$ with *A. fatua*, while the other apparently had 20 pairs of *fatua* and one pair of *barbata* chromosomes designated $\beta_1\beta_1$. The 44-chromosome form had 20 pairs of *fatua* and two pairs of *barbata* chromosomes, $\beta_1\beta_1$ and $\beta_2\beta_2$. All these types generally resembled *A. fatua* but also showed definite *A. barbata* characters due to the presence of specific *barbata* chromosomes and also to crossing-over between the complements of *A. barbata* and *A. fatua*.

416. SHEPELEVA, E. M. 633.13:576.312.34:576.16
**Karyosystematic study on cultivated and wild oats.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 228–31.

The chromosome morphology of several diploid, tetraploid and hexaploid species of oats was studied. On the basis of their karyograms the diploid species *Avena hirtula* and *A. strigosa* appear to be closely interrelated. The tetraploid species *A. abyssinica* and *A. Vaviloviana*, and particularly *A. barbata* have much in common with the diploids. *A. barbata* appears to have two closely related genoms which differ only in a single chromosome. The pairing relationships between this species and *A. strigosa* are considered in detail; it appears probable that the seven bivalents usually formed in this cross are made up by the pairing of five chromosomes of *A. strigosa* with five of *A. barbata* and intergenom autosyndesis of two pairs of *A. barbata* chromosomes.

It is likely that *A. barbata* is an autotetraploid derived from a diploid stock which also gave rise to *A. strigosa*.

The chromosome sets of *A. abyssinica* and *A. Vaviloviana* differ somewhat from *A. barbata* but are similar to each other; *A. abyssinica* which has been studied in detail, appears to have two different genoms of which one is similar to that of *A. strigosa* or *A. hirtula*. *A. fatua* and *A. sativa*, in spite of their taxonomic closeness and the formation of 21 bivalents in their $F_1$, have only 18 chromosome pairs similar in morphology. *A. byzantina* has all the easily distinguishable chromosomes found in *A. fatua* and *A. sativa* and seems therefore to be closely related to them.

The hexaploid oat species seem to differ from the diploids and tetraploid in having a greater number of strongly heterobrachial chromosomes.

417. ROSEN, H. R.,
WEETMAN, L. M. and 633.13–2.111–1.521.6:575(76.7)
MCCLELLAND, C. K. 633.13–2.45–1.521.6:575(76.7)
**Hybridizing oats to combine growth for winter pasture, hardiness, and resistance to rusts and smuts.**
J. Amer. Soc. Agron. 1940 : **32** : 12–14.

The progenies of a large number of oat hybrids designed to combine winter-hardiness, good winter growth and resistance to rusts and smuts are now in the $F_4$ and $F_5$ generations.

Some of the hybrid selections appear to be homozygous for the above characters, and some can be said to be quite promising. G. P. C.

## RYE 633.14

418. Prjanišnikova, Z. D. 633.14:575.14:575.125
**(The question of utilizing the products of inbreeding in rye breeding).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 6 : 15–16.

Cyclic crosses were made between fourteen different plants of the sixth inbred generation of Vjatka rye. Although the $F_1$ plants obtained were very vigorous the $F_2$ showed a marked reduction in vigour and was very heterogeneous.
The experiment was repeated using only the twelve best inbred lines; again the $F_1$ was very vigorous and showed a high degree of self-fertility. When the same inbred lines were crossed in the following year, i.e. after one further generation of inbreeding, when they had become still further depressed in vigour, the $F_1$ plants were, contrary to expectation, still more luxuriant and self-fertile. All these series, however, showed a great reduction of fertility in the $F_2$ generation. Further crosses between plants of the 9th and 10th inbred generations behaved similarly and produced no segregates equal to Vjatka. It is concluded that no useful results are to be obtained from the method of inbreeding or crossing inbred lines in rye.

419. Kakhidze, N. T. 633.14:575.14:576.354.4:576.356
**Meiosis in inbred rye.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 68–70.

Inbred plants of Vjatka rye varied widely in meiotic behaviour. Of five plants examined two had normal chiasma frequency, one had a slightly reduced chiasma frequency and amount of conjugation, and a fourth showed a considerably reduced chiasma frequency and a preponderance of bivalents with only one chiasma, together with occasional lagging chromosomes. The fifth plant had a still lower chiasma frequency and from 0 to 6 univalents. Lagging chromosomes and chromatin bridges and fragments were observed at anaphase.
It is considered likely that most of these irregularities are genotypically controlled.

420. Frimmel, F. 633.14:575.183
Beitrag zur Xenienfrage bei Roggen. **(Contribution to the question of xenia in rye).**
Züchter 1939 : **11** : 301–07.

Races of rye with extremely long and extremely short grains were grown adjacent and some plants left to open pollination, others bagged and selfed and others artificially crossed. The maternal grain shape was reproduced unchanged in all cases. Observations on the ovaries showed clear differences in form between the two races even at the time of flowering, before fertilization had been effected. The grains from crosses between plants of different type were larger and heavier than those from self-pollination; the grains obtained when the large grained type served as maternal parent were distinctly larger however than in the reciprocal cross, showing that the grain size is determined both by the maternal and the paternal parent.
Grains produced by self-fertile plants were larger than those from self-sterile plants. The degree of sterility was also found to be greater in large grained races.

421. Fetissov, A. I. 633.14:576.356
**Reduction division in the 16-chromosome rye.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 146–47.

Frequent chromosome fragmentation at meiosis and frequent failure of pairing are reported in 16-chromosome rye.

422. 633.14:581.481:576.356.5
633.14:575.061.634
Kostoff, D. 633.11:581.481:576.356.52
**Frequency of polyembryony and chlorophyll deficiency in rye.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 479–82.

A reprint of the article summarized in "Plant Breeding Abstracts", Vol. X, Abst. 18.

423. Saltykovskii, M. I. and Saprygina, E. S. 633.14–2.111–1.521.6(47)
**(Winter-hardy winter rye).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 6 : 10–11.

By selecting the few plants that survived a very heavy frost a new strain was derived from the local Bezenčuk yellow grained rye. The new rye proved superior in frost-resistance to the parent variety and to Eliseevskaja, both regarded as the hardiest varieties in Europe.

## MAIZE 633.15

424. 633.15:575:578.08
Jenkins, M. T. 633.15:575.14:575.114:631.557
**The segregation of genes affecting yield of grain in maize.**
J. Amer. Soc. Agron. 1940 : **32** : 55–63.

Seven plants of the Krug variety of maize were inbred for one generation and 16 of the inbred progeny of each then selected at random and top-crossed to the variety. In this way the amount of variation within each group of 16 plants in ability to transmit high average yield to their offspring could be determined. It was found that this variation in yield prepotency was surprisingly small, the coefficient of variability being only 4·45 per cent. This means that there would only be a 1 in 40 chance of a selected plant of the first selfed generation exceeding the average yield for the line by 5·6 bushels or 8·9 per cent. Since most preliminary yield trials used in maize breeding have a relatively low degree of precision, this result shows that it is of little use to select inbred lines for yield prepotency in the later generations, when variability is even lower; instead, good results are much more likely to be obtained by testing a large number of lines at a very early stage of inbreeding.

A new method of breeding "synthetic varieties" of maize for use in sub-marginal areas where hybrid maize would not be profitable is outlined. This consists of selfing plants of a variety for one generation, testing the inbred plants in top crosses and then intercrossing the better inbred lines to build up a synthetic strain. The process could be repeated so that after three or four years of commercial growing of the original seed stock a new stock, further improved, would be available.

425. Shank, D. B. 633.15:575–18:581.44:581.43
**Top-root ratios of inbred and hybrid maize.**
Genetics 1940 : **25** : p. 134. (Abst.).

Ten inbred lines of maize showed highly significant differences in top : root ratio, the value ranging from 2·0 to 3·1. Four $F_1$ hybrids had top-root ratios either lower than or similar to those of the low-ratio parent and in all cases had lower ratios than the high-ratio parent. No significant differences in reciprocal crosses could be detected.

426. Andres, J. Ma. 633.15:575.11.061.6:581.48
Análisis genético del color de endosperma en algunos maices comerciales Argentinos. **(Genetical analysis of endosperm colour in certain Argentine commercial maize varieties).**
Inst. Genét., Fac. Agron. Vet., Univ. B. Aires 1939 : **1** : Fasc. **3** : Pp. 25.

In the Argentine Republic the red grained maize varieties are preferred to the yellow or white and the inheritance of colour has therefore been studied.

In the cross Amarillo Común (syn. Amarillo Klein) x Long White Flint the seeds were deeper yellow in colour when the yellow variety Amarillo served as maternal parent. Ratios of 1 : 1 were obtained in back-crosses with both the hybrid and the reciprocal, though gradations in the shade of the yellow segregates indicated the existence also of modifying factors. The gene for yellow colour proved to be independent of the gene *la* (lazy).

The same yellow variety was crossed with the tester *a.Bb.pl.*$y_1$ and gave dihybrid ratios for yellow endosperm; one of the two genes concerned proved to be closely linked with *Alal* (albino or "ghost") and was thought therefore to be $Y_3$, the other being $Y_1$. Used to pollinate

the tester *fl.ms*$_1$–$y_1$, Amarillo Común gave segregation ratios that showed $Y_1$ to be independent of floury endosperm but closely linked with male sterile.
Similar results were obtained with other yellow varieties and with coloured varieties such as Colorado Cuarentón, Colorado Casilda and Piamontés, whose basic colour constitution is assumed to be identical, the differences in colour being due to modifiers. Long White Flint is given the formula $y_1\ y_1\ Y_3\ Y_3$.

427. MARINO, A. E. 633.15:575.114:581.143.26.035.1
Una variación "tardía" en maíz. (**A "late" variation in maize**).
Rev. Argent. Agron. 1939 : **6** : 237–40.
Plants with a vegetation period of 129 to 143 days and others which failed to come into cob after 5 or 6 months have been observed in open pollinated populations of the variety Colorado Klein and its derivatives to the extent of 1 in 5 or 1 in 30; in other varieties such plants appear only in proportions of approximately 1 : 5,000 to 1 : 50,000. They are thought to be forms with a pronounced short-day reaction and possess certain other characteristic features such as unusually large number of leaves, adventitious roots exceptionally high up the stem and very short internodes.

428. MICHELS, C. A. 633.15:575.12(79.6)
**Hybrid corn and its apparent advantages over open-pollinated varieties.**
Mimeo Leafl. Idaho Agric. Exp. Sta. 1939 : No. 32 : Pp. 6.
The technique of producing hybrid maize is summarized. Certain hybrids from the Middle West of the United States have outyielded the best local open-pollinated varieties in southern Idaho by 10 to 15 per cent. Preliminary trials at Caldwell indicate, however, that hybrids of locally developed inbred lines will give from 10 to 20 per cent further increase in yield.

429. CAPINPIN, J. M. and
ROLLAN, A. O. 633.15:575.125:575(91.4)
**Hybrid vigor in the first generation crosses between strains of Cebu corn.**
Philipp. Agric. 1939 : **28** : 491–503.
Three strains of Cebu Native Flint maize, white, yellow and red, were crossed together in the three possible combinations and the $F_1$ generation was grown in comparison with the parental strains in both wet and dry season plantings. In every case the $F_1$ outyielded the higher yielding parent, the percentage increases ranging between 11·6 and 44·1. In all but one of the six plantings the increase in yield was sufficiently great to make the hybridization procedure profitable (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 727 and Vol. X, Abst. 134).

430. 633.15:575.127.5:575.116.1
LANGHAM, D. G. 633.15:576.16
**The inheritance of intergeneric differences in *Zea-Euchlaena* hybrids.**
Genetics 1940 : **25** : 88–107.
A full account of the work summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 732. Additional linkage data are given. The gene *sd* for the short day character found in teosinte is not linked to marker genes in chromosomes 1–6. The gene *Pd* for paired spikelets is linked to *Tr* for two-ranked central branch of the tassel and two-ranked ear with 20 per cent of crossing-over. These two genes segregate independently from marker genes in chromosomes 1–5, but show a doubtful linkage with the gene *py* (pigmy) in chromosome 6.

431. KIBIZOV, V. P. 633.15:575.14:575.125
(**Breeding maize by the method of crossing inbred lines**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 6 : 17–20.
Descriptions are given of the inbred lines that have given the best results in crossing. In addition to increases in yield, some of the best combinations have been distinguished by

earlier maturity (increases varying up to 6 days), greater standing capacity and lower percentage of rachis.
Some of the multiple hybrids have exceeded Stirling in yield by as much as 33 41 per cent but the method most recommended is that of double crosses.

432. Longley, A. E. 633.15:576.312.34
**Knob positions on corn chromosomes.**
J. Agric. Res. 1939 : **59** : 475–90.
The knobs which are found on mid-prophase chromosomes of maize have been observed at 18 different loci. They are found with much greater frequency at some of these loci than at others. Knobs are never found in close proximity to the centromere; they tend to occur with greatest frequency at a point ranging from about 15·2$\mu$ from the centromere in short chromosome arms to some 37·3$\mu$ in long arms. The knob loci that lie very near to this optimum distance from the centromere form knobs frequently, while those far removed from it only rarely form knobs.
It is considered likely that the 18 knob loci (and possibly others) occur in all varieties of maize studied, but that varieties differ in the amount of "knob material" available. The knob loci compete with each other in the accretion of this substance, those most nearly at the optimum distance from the centromere being most successful.

433. Singleton, W. R. and
Clark, F. J. 633.15:576.356.2:535.61–31
**Cytological effects of treating maize pollen with ultra-violet light.**
Genetics 1940 : **25** : p. 136. (Abst.).
Of 75 plants irradiated with rays of 2967 Å wavelength, 19 showed some imperfect pollen. Of these plants, seven had no chromosomal deficiency observable at pachytene, seven had deficiencies and five were not examined at pachytene, but of these three were apparently normal at diakinesis. Of 21 plants irradiated with rays of 2652 Å, two had some bad pollen; one of these had an observable deficiency while the other had not. Deficiencies were observed on chromosomes 2, 4, 6, 7 and 10. There was one translocation and a case in which the long arm of chromosome 6 appeared to be absent while the short arm was present in triplicate.

434. Abbe, E. C.,
Randolph, L. F. and
Einset, J. 633.15:576.356.5:581.143:581.45
**Developmental pattern of the leaf blade in 2n and 4n *Zea mays* as related to the structure of the growing point.**
Amer. J. Bot. 1939 : **26** : p. 4s. (Abst.).
Tetraploid growing points of maize are larger than diploid, the difference being due to an increase in cell size and not in cell number. The 4*x* leaf blade is wider in proportion to its length than the diploid.

435. Uber, F. M. 633.15:581.331.2:535.61–31
**Ultra-violet spectrophotometry of *Zea mays* pollen with the quartz microscope.**
Amer. J. Bot. 1939 : **26** : 799–807.
A study of the absorption spectra of maize pollen grains which should be of value in helping to determine the exact amount of energy absorbed by the nuclei in genetic irradiation studies.

436. 633.15–2.112–1.521.6:575(47)
Kozubenko, V. E. 633.15–1.557:575–184:581.46
**(Breeding maize for high yield and drought resistance).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 27–29.
Considerable yield increases are reported as a result of selecting for two cobs per plant in dent corn, the differences being especially evident in dry years, when very few of the selected plants failed to develop at least one cob.

437. Burnham, C. R. and Cartledge, J. L. 633.15–2.451.2–1.521.6:575.116.1 576.356.2:575.116.1
**Linkage relations between smut resistance and semisterility in maize.**
J. Amer. Soc. Agron. 1939 : **31** : 924–33.
Linkages between smut resistance and semi-sterility were studied in crosses between susceptible segmental interchange lines and a resistant Lancaster Surecrop inbred maize back-crossed to a susceptible Leaming inbred. Highly significant deviations from random in the direction expected if linkage existed were obtained in the case of the following interchanges: 1–2c, 1–6a, 1–9b, 2–6a, 3–8a, 6–8a. There were also less significant indications of linkage between smut resistance and the interchanges 2–3a, 2–4d, 3–5a, 3–7b, 3–10a, 4–9a and 9–10a. There is evidence that the locus of 1–2c in chromosome 2 is one of the loci linked with smut resistance. In other cases loci in either or both of the chromosomes involved in the interchange may be responsible for the linkage.
The method of using interchanges and inversions in linkage studies is discussed.

## BARLEY 633.16

438. Hayes, H. K. 633.16:575(71.24)
**Barley varieties registered, V.**
J. Amer. Soc. Agron. 1940 : **32** : p. 84.
The variety Rex is described. This was bred by J. B. Harrington in Saskatchewan from the cross Velvet x Hannchen. It was first distributed in 1939. The variety is better than Hannchen in length and strength of straw and is earlier ripening, and equals Hannchen in yield and bushel weight of grain. It is a lax, six-rowed form with smooth awns.

439. 633.16:575:578.08 633.16:581.331.2.01
Pope, M. N. 633.16:581.321.1.01
**Viability of pollen and ovules of barley after cold storage.**
J. Agric. Res. 1939 : **59** : 453–63.
Unemasculated and emasculated spikes of barley were stored and subsequently tested for the ability of their pollen and ovules to produce seed. The maximum time that productive pollen could be stored was 29 days at 36° F. or 19 days at 40°; pollen did not survive for 14 days at 50°. Ovules produced seed after being stored for 42 days at 36°, 29 days at 40° or 14 days at 50° F.

440. 633.16:575.11.061.634
Shalygin, I. N. 633.16:575.242:537.531
**Genetic analysis of albinism mutations induced in barley by X-radiation.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **25** : 60–63.
Six families of *Hordeum distichon* obtained from an X-rayed stock all segregated in a 3 : 1 ratio for green v. albino seedlings. Crosses between these families were carried out in every possible combination and it was shown that in each case a different gene was responsible. These genes have been given the symbols $a_1$, $a_2$ . . . $a_6$. Normal green chlorophyll production depends on the presence of the dominant allelomorphs of all six genes.

441. Krajevoj, S. J. 633.16:575.41:575.242:537.531
**On natural selection in populations.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 716–19.
Five mutant forms of the barley variety *Hordeum sativum* var. *medicum* Körn. No. 046 were grown together with the parent variety both singly and in a mixed population of the six types. The rates of elimination of the mutants from the populations were studied in two successive years. These rates were much greater in the second year, when the proportion of the normal type in the populations was much higher than in the first. One type of low biological fitness was completely eliminated by the second year.

The mutants used were produced by irradiation with X-rays. They were (1) a type with long awns on the empty glumes as well as the outer palea, (2) a type with compact ears, (3) a form with the rachis twisted below the ear, (4) a weak type practically without awns and (5) a type with tubular leaves like those of the onion.

442. Lomako, A. Z. 633.16:581.48
**(A. F. Judin's naked barleys).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 8 : 32–34.
The striking similarity between Judin's naked barley and the variety Celeste 497/050 is pointed out and it is suggested that the "new" variety is merely a synonym. The unusually high yields obtained with it are, it is shown, the result of better growth conditions. The matter is under investigation.

443. Sadovnikov, G. T. 633.16:581.48
**(A local naked barley).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : p. 24.
A naked barley distinguished by larger grain and exceptionally high tillering capacity was found in a field of ordinary barley in the Smolensk district.

444. 633.16–2.421.1–1.521.6:575.11
Tidd, J. S. 633.16:575.116.1
**Inheritance of resistance to *Erysiphe graminis hordei* in a cross between Featherstone and Nepal barley.**
Phytopathology 1940 : **30** : 24–25. (Abst.).
The $F_2$ and $F_3$ of the cross Featherstone x Nepal were studied in the greenhouse. Nepal is resistant to race 6 of *Erysiphe graminis*, var. *hordei*, and Featherstone is susceptible. Resistance was incompletely dominant, one main gene being concerned. No linkage was found between any of the four character pairs studied : resistance to mildew, hoods v. awns, naked v. hulled seed and short-haired v. long-haired rachilla.

445. 633.16.00.14(79.7)
Barbee, O. E. 633.16:519.241.1
**Barley production in Washington.**
Bull. Wash. St. Agric. Exp. Sta. 1939 : No. 382 : Pp. 48.
Barley variety trials conducted in the State of Washington over a period of years are reported, and an account is given of the correlations found between various plant characters of economic significance.

## MILLETS AND SORGHUM 633.17

446. Mikhailovskii, V. 633.174:575.127.2:633.282:581.143.26
**(A new cultivated plant—perennial sorghum).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 39–40.
Crosses of various cultivated annual sorghums with *S. halepense* were successful when the former were used as maternal parent; crosses with sweet sorghum were the most successful. Segregation occurred in the $F_2$ for time of flowering, some plants giving no seed at all before the onset of frosts. Only a small proportion of the plants had a non-shattering rachis. Most of the hybrids had rhizomes and those with short ones are being selected. The grain was intermediate in size and type.
The somatic chromosome number was 30 in most plants, some however had $2n = 40$.

447. Vasconcellos, J. de Carvalho e 633.18(46.9)
Formas cultivadas de arroz existentes em Portugal (seu estudo botânico e classificação). [**The cultivated forms of rice existing in Portugal (their botanical study and classification)**].
Com. Regulad. Comér. Arroz, Minist. Comér. Indústr., Lisboa 1939 : Pp. 107.
The various characters examined and their respective taxonomic value are discussed and a review is given of the literature on the origin and systematics of *Oryza*. A key for the determination of the varieties grown in Portugal is presented and these are individually described, with illustrations, five new botanical varieties being described in Latin.

448. Chiappelli, R. 633.18:575(45)
La varietà di riso "Stirpe 136". (**The rice variety "Strain 136"**).
Risicoltura 1939 : **29** : 346–50.
The variety, a hybrid of Lady Wright, is again described. It has given highly promising results. It is 7–8 days earlier than Americano 1600, resistant to damage by birds, to lodging and to diseases in general.

449. Nakayama, K. 633.18:575.242–181.13
(**On the heritable dwarf characters in rice, *Oryza sativa* L.**).
Jap. J. Genet. 1939 : **15** : 170–78.
The literature on dwarf plants in rice is summarized in tabular form. All the types described arose as natural mutants with the exception of one described by Oryoshi which was obtained by X-ray treatment. All these dwarf plants have an apparently normal chromosome complement. In the types examined by the author in 1937 the dwarf gene did not manifest itself during the development of the embryo and it appears that its action does not begin until germination starts.
The genetic relationships between the different dwarf types are as yet unknown. According to Nagai the size of all plant organs is positively correlated as if determined by the same gene, but Adachi reports a short-stemmed plant with grains 6mm. long, indicating that grain size may sometimes be determined independently of the size of the vegetative organs.
The dwarf types almost invariably have dark green leaves. This is due to the concentration of chloroplasts in a small leaf area, and to a greater leaf thickness.
No definite relationship can be traced between dwarfness and sterility; where the latter occurs it is usually male sterility.
Dwarf rice plants are generally weak physiologically. Yamazaki has shown them to be resistant to potassium chlorate.

450. Meulen, J. G. J. van der 633.18:575.42
Massa-selectie bij sawahrijst. (**Mass selection in sawah rice**).
Landbouw 1939 : **15** : 733–35.
Having dealt with the genetic and other causes leading to impurity in rice varieties in the Netherlands East Indies and the consequent reduction in their economic value, the use of mass selection is considered. The technique is described in detail.

451. 633.18:576.312.34:576.16
Sakai, K. 633.18:576.356.5
(**Preliminary note on the nucleolus and nucleolar chromosomes in *Oryza sativa* L.**).
Commemoration Papers on Agronomy Prepared in Honour of Professor Masao Akemine on the Occasion of the Thirtieth Anniversary of His Academic Service by his Friends and Pupils, April, 1938 : 161–68.
Rice varieties with one and with two pairs of nucleolar chromosomes were found. Among the forms studied by the author the Japanese varieties (*O. sativa* ssp. *japonica*) had one

nucleolar pair while the Chinese varieties (ssp. *indica*) had two pairs. In the $F_1$ between the two races there were 12 bivalents, indicating that the structural difference in the chromosome complement is not great enough to prevent pairing.
An autotetraploid *japonica* form that arose spontaneously had two pairs of nucleolar chromosomes.

452. Germek, E. 633.18:581.162.3
A hibridação no arroz. (**Hybridization in rice**).
J. Agron., S. Paulo 1939 : **2** : 329–42.
The floral biology of the rice plant is described, and the amount of natural cross-pollination occurring in different countries is discussed, the extent in Brazil being found to be quite low. The various methods of hybridization that have been used by different workers are described. The author has used with success the ordinary method of cutting off the tips of the glumes obliquely, removing the anthers and introducing the pollen; various points to be borne in mind in carrying out the work of hybridization are mentioned and a list of dominant characters is given, with the recommendation that if possible one of these should be present in the pollen parent to enable the hybrids to be distinguished from accidental selfs. A germination of 94 per cent was obtained in the hybrid seeds, the average set of seed being 43·6 per cent; of these an average of 5·9 per cent were selfs.

453. Meulen, J. G. J. van der 633.18:581.162.32
Over de natuurlijke kruisbestuiving bij rijst en resultaten van een onderzoek daarover op Java. (**Natural crossing in rice and results of experiments on this subject made in Java**).
Landbouw 1939 : **15** : 649–732; also Meded. Alg. Proefst. Landb., Buitenzorg 1939 : No. 38 : Pp. 84.
A critical survey is made of relevant literature and of work that has been done on cross-pollination in rice in the Netherlands East Indies and elsewhere.
The author has studied the mode of pollination in rice (cf. "Plant Breeding Abstracts", Vol. IV, Abst. 169). He regards the wind as a more significant factor in cross-pollination than insect activity.
Field observations at various centres in the Netherlands East Indies show that natural crossing is an important cause of degeneration of the rice varieties in the colony and is of special significance as regards rice improvement work.
In the lay-out of his experiments on natural cross-pollination the writer adopted a method whereby a double set of results could be obtained from the various crosses, instead of one set only.
The experiments showed that natural cross-pollination varied among the Boeloe (Bulu) varieties according to which varieties were used as the maternal or paternal parents in the cross, the variation being much more affected by the pollen. If the pollen parent is of the Boeloe type the amount of natural crossing ranges from medium to slight; but when the pollen parent is a Tjereh variety the range is from considerable to very considerable.
In the case of Tjereh varieties the percentage of natural crossing is as a rule very low, regardless of whether the pollen parent is of the beardless Tjereh or bearded Boeloe type.
Various possibilities, including the results of an experimental study of varietal differences in pollen production, are considered in attempting to explain the difference in the incidence of cross-pollination in (1) the Boeloe and Tjereh groups respectively and (2) within these two individual groups. The author is inclined to regard varietal differences in the temperature and humidity requirements for dehiscence as the most likely explanation.
Experiments on the influence of spacing and of inter-planting upon cross-pollination showed that at a distance of 3 to 3·75 metres crossing was generally less than 1 per cent.
The last section of the paper is devoted to useful hints to growers on how to maintain the purity of their varieties.
A bibliography and extensive tables (with English headings) showing the experimental results are provided.

454. Nagao, S. and
Takano, T. 633.18:581.331.2:581.466
**(Duration of the preservation of the fertilization possibility in pollen and stigma of rice-plant).**
Commemoration Papers on Agronomy Prepared in Honour of Professor Masao Akemine on the Occasion of the Thirtieth Anniversary of His Academic Service by his Friends and Pupils, April, 1938 : 88–92.

Rice pollen was found to deteriorate rapidly and no seed was set when it was used five minutes after being collected from dehiscing anthers. Stigmas were receptive at least for some time after emasculation.

455. Ryker, T. C. 633.18–2.484:576.16:631.521.6:575(76.3)
**Physiological specialization in *Cercospora oryzae*.**
Phytopathology 1940 : **30** : p. 21. (Abst.).

*Cercospora* leaf spot is the most serious disease of Blue Rose rice, which occupies about 75 per cent of the Louisiana acreage. Several disease-free plants were collected in a heavily infected field in 1936 and from one of them a selection, 2854–3, which was indistinguishable from Blue Rose in type, was made. This appeared to be resistant to *Cercospora*. In certain artificial inoculations in 1939, however, it proved susceptible. The reason is shown to be the existence of at least three physiological forms of the fungus, to one of which 2854–3 was susceptible. Certain varieties appear to be resistant to all strains of the fungus.

## FORAGE GRASSES 633.2

456. 633.2:575(45)
Avanzi, E. 633.3:575(45)
Prove comparative con leguminose foraggere di varia provenienza e contributo di ricerche per il miglioramento di razza di alcune essenze pratensi.
**(Comparative tests of forage legumes of diverse origin and a contribution to researches on the racial improvement of certain meadow components).**
Staz. Agrar. Sper. San Michele all'Adige, Trento 1938 : Pp. 21.

In lupins considerable differences have been noted between plants in respect of earliness, type of plant, size and form of the leaves, flower colour and size of seeds. The best plants are being isolated and intercrossed, by which means the production of improved strains is expected.

The same applies to a number of leguminous and graminaceous forage plants.

457. Nielsen, E. L. 633.2:576.312.35
**Grass studies. III. Additional somatic chromosome complements.**
Amer. J. Bot. 1939 : **26** : 366–71.

The following somatic chromosome numbers are reported:—*Bromus inermis* Leyss. 56 and 70 in different races, *B. marginatus* Nees 42 and 70, *B. commutatus* Schrad. 56, *B. secalinus* L. 14, *Glyceria grandis* S. Wats. 28, *Eragrostis curvula* (Schrad.) Nees 40, *E. sessilispica* Buckl. 40, *E. spectabilis* (Pursh.) Steud. 40, *Elymus canadensis* var. *robustus* (Scribu. & Smith) Mackenz. & Bush 28, *E. Macounii* Vasey 28, *E. sibiricus* L. 28, *Calamagrostis epigeios* (L.) Roth. 28, *Agrostis exarata* Trin. 28, *Sporobolus cryptandrus* (Torr.) A. Gray 18, *S. heterolepis* A. Gray 72, *Stipa pulchra* Hitch. 66, *S. columbiana* Macoun 44, *Muehlenbergia pungens* Thurb. 60, *Buchloë dactyloides* (Nutt.) Engelm. 60, *Paspalum Urvillei* Steud. 40 and 60, *Panicum anceps* Michx. 18, *P. Lindheimeri* Scribn. 18, *P. texanum* Buckl. 36, *Andropogon furcatus* Muhl. 60, *A. Hallii* Hack. 60 and 70, *A. scoparius* Michx. 40, *A. saccharoides* Sw. 60 and 70, *A. perforatus* Trin. 80. The source and collector of the material studied are given as well as the size of the chromosomes and the nucleus. The results are discussed, especially with reference to polyploidy and some morphological differences between cytologically distinct races of certain species are indicated.

J. L. F.

458. Brown, W. L. 633.21:576.312.35:576.356.5
**Chromosome complements of five species of *Poa* with an analysis of variation in *Poa pratensis*.**
Amer. J. Bot. 1939 : **26** : 717–23.
The following chromosome numbers of American species are reported for the first time: *P. Wolfii* Scribn. $2n = 28$, *P. arachnifera* Torr. $2n = 42$, *P. cuspidata* Nutt. $2n = 28$, *P. sylvestris* A. Gray $2n = 28$. In *P. pratensis* somatic numbers ranging from $41 \pm 1$ to 64 were found. The morphological variability of this species is described and explained in terms of polyploidy and apomixis. It is suggested that the chromosome complement is made up of a number of "A" genoms and a number of "B" genoms and the different balances obtained between them influences the morphological characters of the individual. J. L. F.

459. Myers, W. M. 633.22:575.11.061.634:576.356.5
**Tetrasomic inheritance in *Dactylis glomerata*.**
Genetics 1940 : **25** : p. 126. (Abst.).
The formation of quadrivalents at meiosis in *D. glomerata* (cf. Abst. 460 below) leads one to expect the occurrence of tetrasomic inheritance. A 35 : 1 ratio for green v. chlorophyll-deficient seedlings was obtained in the selfed progeny of one plant. In the next generation, of 63 plants tested, 16 produced green seedlings only, 32 gave 35 : 1 and 15 gave 3 : 1 ratios. Supposing that the original plant was duplex (*AAaa*), the expected proportion of the types is 16·2 : 32·4 : 14·4, a good fit with the observed values.

460. 633.23:576.354.4
Myers, W. M. and 633.289:576.354.4
Hill, H. D. 633.265:576.354.4
**The association and behavior of chromosomes in autotetraploid grasses.**
Genetics 1940 : **25** : p. 129. (Abst.).
The mean frequencies of quadrivalents in plants of *Dactylis glomerata*, *Agropyron cristatum* and *Arrhenatherum elatius* (syn. *A. avenaceum*) were 3·9, 3·7 and 3·8 respectively, out of a possible total of 7 in each case.
The number of cells with lagging chromosomes at anaphase I varied from 3 per cent to 66 per cent and corresponded to the number of cells with unpaired chromosomes at metaphase I, though in most cases there was an excess of laggards. These unpaired chromosomes divided equationally at anaphase I and in from 13 to 52 per cent of cases the daughter halves formed micronuclei at the tetrad stage.
Each of the 11 plants studied was heterozygous for one or more inversions.

461. Franzke, C. J.,
Puhr, L. F. and
Hume, A. N. 633.257.4:575–18:581.192.6
**A study of sorghum with reference to the content of HCN.**
Tech. Bull. S. Dak. St. Coll. 1939 : No. 1 : Pp. 51.
A study of methods of estimating HCN in plant tissue is reported; the method finally adopted was precipitation with silver nitrate.
Sorghum varieties were found to vary considerably in HCN content, Sudan grass being consistently the lowest. Great variations were also found between strains of a single variety, and high and low HCN strains of Dakota Amber with 2,570 and 410 parts per million of HCN respectively were isolated, the latter value being as low as that for Sudan grass (420 p.p.m.). A similar low-HCN strain of Milo was isolated and it seems possible that such strains may be found in all sorghum varieties.
Crosses between high- and low-HCN strains gave an $F_1$ with HCN content resembling that of the low parent. In the $F_2$ there was segregation with most of the plants tending to be low. $F_3$ data show a similar trend and confirm the existence of Mendelian segregation in the $F_2$. It is therefore considered as established that the HCN content is genetically determined, with

low HCN tending to be dominant; the number of genes concerned is not known but there are probably only one or two major genes and perhaps a number of modifiers.
In a cross between a high-HCN Amber line and a low-HCN Milo, there appeared to be a linkage between low HCN content and the Milo plant characters.
The effect of various environmental conditions on HCN content is considered at length.

462. Smirnova, M. I. and
Katanskaja, G. A. 633.257.4:581.192.5:575–18:578.08
**A biochemical method of large scale estimation of prussic acid in sorghum for breeding purposes.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 592–95.

The technique described for estimating HCN is the picrate paper method of Guignard.
It is shown that sorghum varieties differ in HCN content and that strains within varieties also differ; this intravarietal variability is much greater in some cases than others and it would appear to be impossible to select lines low in HCN in some varieties.
Another interesting observation is that HCN content in some lines is much more subject to environmental influence than in others.

463. Cugnac, A. de 633.262:575.127.2:576.12
Conséquences génétiques et phylétiques du croisement de deux Graminées.
**(Genetical and phyletic consequences of the cross of two Gramineae).**
C.R. Acad. Sci., Paris 1939 : **209** : 696–98.

Cugnac, A. de 633.262:575.127.2:575.172.3
Un cas remarquable de pléiotropie dans une hybridation de Graminées.
**(A remarkable case of pleiotropism in a cross of Gramineae).**
C.R. Soc. Biol., Paris 1939 : **132** : 404–06.

These two papers deal with a cross between *Bromus arduennensis* (which has glabrous spikelets) and *B. grossus* (which has pubescent spikelets). The two species differ in many other morphological features. The $F_1$ is fully fertile, regardless of which way the cross is made, and all the *B. grossus* characters are completely dominant. In $F_2$ dihybrid segregation occurs for pubescence or its absence which is apparently determined by one gene pair, and for all the remaining differential characters *en bloc*, which are apparently determined by the second pair of genes. The double recessive type was not actually obtained.
On the grounds of their genetical behaviour the two species must, the writer believes, be very closely allied and the existing systematic classification of certain *Bromus* species should be critically examined.
Similar results were noted in crosses of *B. arduennensis* with *B. arvensis* or *B. macrostachys*, *B. arduennensis* behaving as completely recessive, though the number of genes involved could not be determined in these two crosses owing to the sterility of the hybrids.

464. 633.263:576.356.5:581.04
Myers, W. M. 576.356.5:581.04:578.08
**Colchicine induced tetraploidy in perennial ryegrass *Lolium perenne* L.**
J. Hered. 1939 : **30** : 499–504.

Tetraploid sectors were produced in plants of *L. perenne* by germinating seeds on blotting paper soaked in colchicine solution and also, in one plant out of three, by injecting the solution into growing plants with a hypodermic needle. The latter method may be especially useful for inducing polyploidy in species hybrids where seed production is very limited.
Tetraploid progenies have been obtained from some of the treated plants.

465. 633.31/37:576.312.35:576.16:576.356.5
SENN, H. A. 635.65:576.312.35:576.16:576.356.5
**Chromosome number relationships in the Leguminosae.**
Bibliogr. Genet. 1938 : **12** : 175–336.

A comprehensive list is given of the chromosome numbers of 436 species of 74 genera of the Leguminosae, the data including original observations on 106 species. The basic chromosome number of the family appears to be 8. The 7-chromosome Vicieae probably arose as hypoploids from the primitive 8-chromosome stock, while the 11-chromosome Phaseoleae may have arisen through hybridization of a tetraploid of the 7-chromosome Vicieae with a diploid of an 8-chromosome type.

Various phylogenetic problems in the Leguminosae are discussed in the light of the chromosome counts, and a hypothetical phylogenetic chart of the family is given.

The proportion of polyploids and polyploid derivatives in the family is very low, some 23 per cent. Aneuploid differences often distinguish genera or groups. There is no clear correspondence in the family between polyploidy and geographical distribution.

It is shown that woody legumes have on the average a higher chromosome number than herbaceous species, and that this relation also holds within certain closely related groups. These findings suggested that, contrary to the opinion of many botanists, woody plants have been derived from more primitive herbaceous forms.

466. WIPF, L. and 633.31/37:576.356.5:632.3
COOPER, D. C. 635.656:576.356.5:632.3
**Somatic doubling of chromosomes and nodular infection in certain Leguminosae.**
Amer. J. Bot. 1939 : **26** : p. 3s. (Abst.).

Cells with the tetraploid chromosome number are occasionally present in the cortical parenchyma of the root hair region of roots of *Pisum sativum*, *Lathyrus latifolius*, *L. odoratus*, *Lespedeza tomentosa* and *Vicia villosa*. These seem to be related to nodule formation; in regions where nodular stimulation occurs tetraploid cells are found. Infection threads penetrating regions of the root without such cells cause no stimulation, and they have a pathogenic effect on the nuclei of the diploid cells they penetrate. In later stages rhizobia are found only in tetraploid cells.

467. LEDINGHAM, G. F. 633.311:575.127.2:633.312:576.356.5
**Cytological and developmental studies of hybrids between *Medicago sativa* and a diploid form of *M. falcata*.**
Genetics 1940 : **25** : 1–15.

*M. falcata* exists in both the diploid ($2n = 16$) and the tetraploid form and only the latter crosses readily with *M. sativa* ($2n = 32$).

Embryological studies show that fertilization takes place both in the cross *M. falcata* (diploid) x *M. sativa* and in the reciprocal; in the former embryo development continues for about two weeks and a mature pod is formed, while in the latter embryo development usually stops after two days and the flowers drop. The author explains this behaviour in terms of embryo-endosperm balance in chromosome number.

Exceptionally, hybrids are produced. In 1937 two triploids ($2n = 24$) were obtained from pollinations of *M. sativa* by *M. falcata*. Attempts to repeat this, involving the pollination of 774 flowers, were unsuccessful and though 18 plants were grown from the 28 seeds obtained, they are apparently regarded as selfs. The mature pods obtained from the cross *M. falcata* x *M. sativa* contain mostly shrunken, inviable seeds, together with a few viable seeds which give tetraploid hybrids.

At the first meiotic metaphase in the triploids $8_{II} + 8_{I}$ was a common arrangement. The triploids set no seed on selfing or intercrossing but were moderately fertile when back-crossed with the parents. From the cross triploid x *M. falcata* plants with 16, 17 and 18 somatic chromosomes were obtained and from the cross triploid x *M. sativa*, plants with somatic chromosome numbers from 30 to 36, most frequently 32, in which case chromosome behaviour was regular.

Meiosis in the tetraploid hybrids, which could be recognized as hybrids by their flower colour, was fairly regular, 16 bivalents being commonly formed at first metaphase, though univalents were not infrequent. These hybrids which have received 16 chromosomes from the diploid parent, instead of the normal 8, were quite fertile, though exhibiting a degree of self-incompatibility intermediate between the highly self-incompatible *M. falcata* and the partially self-incompatible *M. sativa*. Their progeny is very variable.
*M. falcata* is not separated from *M. sativa* by any inability of their respective chromosomes to pair in the hybrids between them. The tetraploid forms of *M. falcata* cross with *M. sativa* to give a highly polymorphic group of forms within which species differentiation is impossible. The diploid forms of *M. falcata* on the other hand are isolated from the tetraploid *M. sativa* because the difference in chromosome number produces an upset in endosperm embryo balance in the developing hybrid seeds, leading in turn to the frequent abortion of the latter.
Attempts to cross *M. lupulina*, *M. platycarpa*, *M. ruthenica* and another diploid, unidentified species with diploid *M. falcata* or with *M. sativa* were unsuccessful. J. L. F.

468. Brink, R. A. and
Cooper, D. C. 633.311:581.162.5:581.483:575.12
**Somatoplastic sterility in *Medicago sativa*.**
Science 1939 : **90** : 545–46.

Brink, R. A. and
Cooper, D. C.
**The significance of double fertilization in flowering plants.**
Genetics 1940 : **25** : p. 113. (Abst.).
The early collapse of fertilized ovules in *Medicago sativa* is about five times as frequent following selfing as after cross-pollination. This type of sterility, termed "somatoplastic", is due to excessive growth of the inner integument; apparently the endosperm must grow sufficiently vigorously to compete successfully with the maternal tissues if the seed is to develop, and inbred endosperms do not grow as rapidly as hybrid endosperms and so more often fail to survive.

469. Lubenez, P. A. 633.311–1.524.4:575.12:576.16
**(Improvement of local varieties of lucerne and organization of their seed production by methods of ground-control and field inspection).**
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. **16** : 19–27.
French lucerne was imported long ago into the Krasnodar and Rostov areas and by a process of hybridization with the local wild yellow lucerne followed by natural selection a number of local strains have originated, distinguished by greater constancy and higher yield. The sources of the best of these strains have been determined and are serving as the basis for an extensive system of seed supply.

470. Atwood, S. S. 633.322:581.162.52:575.113.3
**Cytogenetics of incompatibility in *Trifolium repens*.**
Genetics 1940 : **25** : p. 109. (Abst.).
Thirteen self sterile $F_1$ plants of *T. repens* were crossed in all combinations and back-crossed with their self-sterile parents. The $F_1$ plants formed four intra-sterile, inter-fertile groups consisting of 1, 3, 4 and 5 plants respectively, and all were reciprocally fertile with both parents. Compatible crosses averaged 44·9 seeds per ten flowers and incompatible crosses 0·26 seeds. Another series of 13 $F_1$ plants from different parents gave similar results and all were compatible in crosses with plants of the first series. These results are best explained on the paired oppositional factor hypothesis, the parents in each cross differing from each other in both allelomorphs. The two groups of plants taken together indicate the presence of at least seven different allelomorphs and the fact that over 200 matings of unrelated plants carried out by the author were all compatible suggests that the number of allelomorphs existing is large.

One of the parents of the second group of $F_1$ plants was highly "pseudo-fertile", i.e., it was practically self-sterile when individual flowers were selfed in either full flower or the bud but it set selfed seeds when entire heads were rubbed to effect pollination. Its progeny resembled it in this character, the genes for which are independent of those determining cross-incompatibility.

471. Pierce, W. P. 633.364:576.312.35:576.356.5
**Cytology of the genus *Lespedeza*.**
Amer. J. Bot. 1939 : **26** : 736–44.

The following chromosome numbers are reported: *L. bicolor* Turcz. $2n = 22$, *L. cyrtobotrya* Miq. $2n = 22$, *L. cyrtobotrya* var. *pedunculata* Nakai $2n = 22$, *L. violacea* Pers. $2n = 20$, *L. Stuvei* Nutt. $2n = 20$, *L. floribunda* Bge. $2n = 22$, *L. virgata* DC. $2n = 22$, *L. repens* Bart. $2n = 20$, *L. sericea* Benth. $n = 9$, *L. capitata* Michx. $2n = 20$, *L. variegata* Cambess. $2n = 20$, *L. hirta* (L.) Hornem. (= *L. villosa* Pers.) $2n = 20$, *L. pilosa* Maxim. (also ascribed to Siebe et Zucc.) $= 20$, *L. macrocarpa* Bge. $2n = 22$, *L. striata* var. *Kobe* $2n = 22$, *L. procumbens* Michx. $2n = 20$, *L. frutescens* (L.) Britton $2n = 20$, *L. latissima* Nakai $2n = 20$, *L. inschanica* (Maxim.) Schind. $2n = 20$, *L. Maximowiczii* Gandog. (= *L. bicolor* Turcz.) $2n = 22$, *L. Thunbergii* Nakai $2n = 22$, *L. virginica* (L.) Britton (= *L. sessiliflora* Michx.) $2n = 22$, *L. japonica* var. *intermedia* (Nakai) Nakai $2n = 22$, *L. robusta* Nakai, $2n = 22$, *L. daurica* Schind. $2n =$ ca. 44, *L. daurica* var. *Shimadai* (Masamune) Masam. and Hosokawa $2n =$ ca. 44. Previously reported numbers which disagree with those reported here are also given, viz. *L. bicolor* Turcz. $n = 9$ (Kawakami, 1930), *L. cyrtobotrya* Miq. $n = 9$ (Kawakami 1930) *L. variegata* Cambess. $2n = 18$ (Cooper, 1936), *L. daurica* Schind. $2n = 36$ (Cooper, 1936).

The morphology of the somatic metaphase chromosomes of the different species is briefly described. It is suggested that 10 is the basic number for the American species and 11 for the rest of the genus. J. L. F.

472. Klinkowski, M. and Griesinger, R. 633.376:576.356.5:581.04
Versuche zur Erzeugung polyploider Rassen bei der Gattung *Ornithopus*.
(**Experiments on the production of polyploid races in the genus *Ornithopus*).**
Züchter 1939 : **11** : 313–17.

Experiments were made to determine the most suitable doses of colchicine for treatment of seeds and flower buds. For the former a solution of 0·1 per cent was found to be the most effective in *O. sativus* and from 500 treated seeds four aberrant plants were produced; their root tissues were diploid ($2n = 14$) but the floral tissues had chromosome numbers varying from the diploid to the octoploid number, various intermediate numbers being observed. Neighbouring cells varied widely in chromosome number, the majority of the cells however having numbers higher than tetraploid.

Marked meiotic irregularities were observed.

## ROOTS AND TUBERS 633.4

473. Stevenson, F. J. 633.491:575(77.1)
**Potato varieties better suited to a specific set of growing conditions.**
Proc. 24th Annu. Mtg Ohio Veg. and Potato Gr. Ass. 1939 : 14–18.

The author stresses the desirability of concentrating research effort and expenditure on the production of potato varieties combining good economic qualities with disease resistance. This is of much greater value than attempts either to alter the environmental conditions to suit each particular variety or to control diseases with sprays and insecticides.

Mention is made of the position already attained in the production of varieties resistant or immune to virus, late blight and common scab, and possessing in addition other economically important characters. J. G. H.

474. 633.491:575(77.1)
633.491:581.6

Tussing, E. B.

**Potato demonstration results in 1938.**

Proc. 24th Annu. Mtg Ohio Veg. and Potato Gr. Ass. 1939 : 5–9.

Six late potato seedlings obtained from the U.S. Department of Agriculture outyielded the Russet Rural check variety in tests in Ohio. One of these seedlings was eliminated because of yellow flesh. Seedling 47,101 appeared to be particularly desirable.

The relative value of various potato varieties for the manufacture of potato crisps is tabulated.

475. Bukasov, S. M. 633.491:576.16

El origen de las especies de papa. (**The origin of potato species**).

Rev. Argent. Agron. 1939 : **6** : 230–36.

This is a Spanish version of the article referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 1507.

476. Ivanov, V. I. 633.491:576.356.5:575.127.2

**Formation of polyploid forms in *Solanum* sect. *Tuberarium*.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 486–88.

A hybrid formed by crossing the fertile, *Phytophthora* resistant *S. Antipoviczii* ($2n = 48$) ♀ with the rather infertile *S. tuberosum* Mirabilis ($2n = 48$) ♂ was found to possess 72 somatic chromosomes, indicating that one of the gametes (probably that from the female plant) was unreduced.

The resistant $F_1$ plant showed 34–42 (mostly 36–39) elements at metaphase of the first meiotic division, presumably produced autosynedetically. $F_2$, $F_3$ and $F_4$ plants possessed 69–70 somatic chromosomes.

Hybrids with *S. Antipoviczii* using the male-sterile varieties Epicure and Narodny [syn. Imperator] as female parents also possessed 72 somatic chromosomes but were completely sterile. In this case it was thought that *S. tuberosum* had provided the unreduced gamete.

J. G. H.

477. Johnstone, F. E. (jun.) 633.491:576.356.5:581.04

**Chromosome doubling in potatoes induced by colchicine treatment.**

Amer. Potato J. 1939 : **16** : 288–304.

Attempts to produce doubling of potato chromosomes by colchicine met with very great success as against the poor results obtained from callus and heat treatment.

The best results were obtained when colchicine was applied to seeds in 0·5 per cent aqueous solutions during germination. The tubers of cultivated varieties which do not breed true from seed were treated with 1 per cent colchicine in lanolin paste in such a way that the newly germinating sprouts had to grow through the paste. It seemed necessary to apply concentrations approaching the lethal dosage in order to get complete tetraploidy.

The tetraploids were identified by root tip counts and measurements of stoma and pollen grain size. The former method was found to have the disadvantage that most of the plants being incompletely tetraploid, the root tips were quite often different in chromosome number from other parts of the plant. In attempts to obtain wholly tetraploid plants, cuttings were made from portions of plants where the stoma size indicated tetraploidy.

Success was attained with Russet Rural and Golden varieties, in seedlings of U.S.D.A. lines S.164-196, S.164-126 and Louisiana line T3–4, and in the wild species *S. Jamesii*, *S. chacoense*, *S. bulbocastanum*, *S. andigenum* and *S. neoantipoviczii*. No success was obtained with *S. acaule*, *S. ajuscoense*, *S. Commersonii*, *S. curtilobum*, *S. demissum*, *S. Fendleri*, *S. Maglia*, and *S. polyadenium*.

The "tetraploids" of the 48 chromosome *S. andigenum* and *S. tuberosum* were dwarfed, lending support to the hypothesis that these species are already tetraploids. The tetraploids of the 24 chromosome *S. Jamesii*, *S. chacoense* and *S. bulbocastanum* were as large as, or in the case of *S. Jamesii*, larger than the corresponding diploids. J. G. H.

478. Ivanovskaja, E. V. 633.491:576.356.52:575.127.2:581.481
**A haploid plant of *Solanum tuberosum* L.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 517–20.
In a cross between *S. tuberosum* Aurora ($2n$ = 48) x *S. Rybinii* Juz. et Buk. ($2n$ = 24) a plant with a somatic chromosome number of 24 was produced, possessing none of the characters of *S. Rybinii* and differing in several respects from Aurora.
In both the hybrid and the female parent two embryo sac mother cells are found and it was concluded from this and other evidence that the haploid had arisen apogamously from one of these, stimulated by its twin which had possibly been fertilized.
Pairing was practically normal in the haploid but the reduced gametes were not functional. This is considered to be evidence that *S. tuberosum* is of allopolyploid and not of autopolyploid origin. J. G. H.

479. Stevenson, F. J. 633.491:581.6:575.2
**Variability in cooking quality in potatoes.**
Proc. 24th Annu. Mtg Ohio Veg. and Potato Gr. Ass. 1939 : 42–46.
Tests made by growing the variety Katahdin in 32 different localities in the U.S.A. and Canada showed significant differences in the cooking quality. The standards of the five independent judges also varied considerably. Similar results were obtained with Chippewa, Green Mountain and Russet Burbank. Distinct differences were seen also between a number of varieties grown and tested under comparable conditions. Quality therefore depends on genetic factors though their expression is modified by environmental factors. J. G. H.

480. Soukup, V. 633.491–1.524.4(85)
La clasificación de las papas del departamento de Puno. (**The classification of the potatoes from the department of Puno**).
Bol. Minist. Fom., Lima 1939 : No. 18 : Pp. 72.
Part one gives an outline of the methods used in the description and propagation of cultivated potatoes. In the second part is a key for the identification of 65 native Peruvian potato varieties from the department of Puno, based mainly on tuber characters. This is followed by morphological descriptions of the varieties (with illustrations of the tubers and sprouts), notes on their distribution and the average yield obtained at the Granja Salcedo, Puno, Peru. J. G. H.

481. *Piekarski, A. 633.491–2.412.5–1.521.6(43.8)
Dobór odmian rakoodpornych na Śląsku. (**Selection of wart-resistant varieties for Silesia**).
Roczn. Ochrony Roślin 1939 : **6** : No. 2 : 19–27.
Very few Polish potatoes are wart-resistant and tests have been made of a number of varieties imported from Germany, Ackersegen having proved one of the most popular. The main defect of this variety is its lateness and the merits of a number of earlier maturing varieties are examined.
The conclusion reached after the study of all the varieties is that the healthiness and regularity of yield become less with increasing earliness of maturity, a tendency which, it is urged, should be overcome by potato breeders.

482. Björling, K. 633.491–2.412.5–1.521.6:575:578.08
Från Växtskyddsanstaltens Potatiskräftlaboratorium i Svalöv. (**From the Plant Protection Institute Potato Wart Disease Laboratory in Svalöf**).
Växtskyddsnotiser 1939 : No. 6 : 93–97.
The work of the above laboratory, which has been functioning since 1936, deals with the testing of potatoes for wart disease, including the large yearly supplies of breeding material produced by various institutes. The present paper discusses: the disease, its mode of attack, the absence of physiological specialization of the fungus, and in detail, the simple technique

* An extended summary of this paper is on file at the Bureau.

used for testing resistance and suggestions for increasing its reliability so that the amount of material for testing and the time required may be reduced. Experiments in 1939 on the effect which the length of the sprout in tubers used in infection tests may have upon the result showed that the occurrence of long sprouts here and there in the varieties tested considerably reduced the reliability of the result. It is suggested that only tubers with sprouts of medium length (1 -2 mm.) should be included in wart disease tests and also that with such a provision fulfilled a reliable result can be obtained even if only two or three tubers per variety are tested.

483. SLEESMAN, J. P. 633.491–2.7–1.521.6
**Resistance in wild potatoes to attack by the potato leafhopper and the potato flea beetle.**
Amer. Potato J. 1940 : **17** : 9–12.

*Solanum polyadenium* was highly resistant, if not immune, to attacks of the potato leaf hopper (*Empoasca fabae*) and the flea beetle (*Epitrix cucumeris*). This resistance may be due to the very disagreeable smell of the foliage, due to an oil or ester.
*S. chacoense, S. Commersonii* and *S. Caldasii* were also highly resistant to the leaf hopper and *S. bulbocastanum* was fairly resistant to flea beetle attack.

484. *HIRAMA, S. 633.492:575(52)
**(Cross-breeding varieties and strains of sweet potatoes).**
Reps Dep. Agric., Gov. Res. Inst., Formosa. Part I, 1929 : No. 44 : Pp. 88; Part II, 1930 : No. 46 : Pp. 48; Part III and IV, 1937 : No. 71 : Pp. 83.

This monograph, the concluding part of which appeared in 1937, contains a record of breeding experiments in Japan to improve the quality and starch content of the high yielding Formosan, Okinawa and Chinese varieties of sweet potato by crossing them with Japanese and American varieties.
The technique used in selection and promoting germination of seeds is outlined.
From the crosses begun in 1922, 559 hybrid strains were obtained and from these four varieties were ultimately selected, Taino 1, 3, 9 and 10 from the crosses Red Skin x American Yellow Skin 8, "Station" x American Yellow Skin 21, Tsugi-imo x Nancy Hall 9, and American Yellow Skin x Red Skin 18 respectively. Taino Nos 1, 3 and 9 have a good flavour and the yield of dried slices is large in the case of No. 10 and No. 1. No. 3 can be cultivated rapidly and continuously. No. 9 is highly resistant to frost injury.
In 1924–25, eight new varieties Taino Nos 16–19 (recommended as best for dried slices) and Taino Nos 20–23 (recommended as best for table use) were evolved by extensive further breeding. Taino No. 16 has the highest yield and is characterized by high starch content, rapid growth and well shaped tubers. No. 17 shows in addition to other good points good keeping quality like No. 22. Taino No. 19 is high yielding, has well shaped tubers and is tolerant of salty soils. Taino No. 21 has a good yield and flavour but is subject to a disease causing shrivelling of the buds during the rainy season.
From 1926–30 the work was continued on an even larger scale and after from 5 to 7 years' study 10 new varieties, Taino Nos 24–33, were distributed for the first time during 1937 to the various experiment stations. The quality and yield of several of these varieties is high and Nos 24, 28 and 33 are suitable for starch manufacture, as well as distillation.
Full tables showing the various crosses made and the characteristics and performance of the various types obtained are appended to all three parts of the monograph.

485. WATANABE, K. 633.492:576.312.35
**(Chromosomes of Japanese sweet potatoes and their allied plants).**
Proc. Crop. Sci. Soc. Japan 1939 : **11** : 124–34.

A study of the chromosome numbers of varieties of the sweet potato (*Ipomoea Batatas*) and of allied species and genera in Japan showed the chromosome number of *I. Batatas* to be $2n = 90$ in five varieties and of the other *Ipomoea* species to be $2n = 30$.
The chromosomes of *Ipomoea, Pharbitis, Colonyction, Hewittia, Operculina* and *Merremia* species were nearly the same size, which is taken as indicating a certain systematic relationship between the forms investigated.

* An abridged translation of this monograph is on file at the Bureau.

486. Miller, J. C. 633.492:581.145.1:575:578.08
**Further studies and technic used in sweet potato breeding in Louisiana.**
J. Hered. 1939 : **30** : 485–92.

Experiments conducted to determine the best method of inducing flowering in the sweet potato (*Ipomoea Batatas*) in Louisiana are described. The most effective treatment was to take stem cuttings in August and overwinter them in 10-inch pots, transferred to the greenhouse as soon as there is danger of frost. These cuttings were planted in the field in the spring and trained on a 7-foot trellis, the stems being cut two-thirds of the way across at the base. "Girdling" the stems in this way led to an accumulation of food substances in the part above the cut, and promoted flowering.

The effects of various weather conditions on seed setting are described. The best time of day for pollination was 8 to 10 a.m. in the autumn or 7 to 9 a.m. in the spring. Selfed flowers seemed to set seed better when pollinated in the earlier part of this range.

Varietal differences in flowering and seed setting are discussed; these seem to be in part due to differences in photoperiodic response. In the proper conditions it appears that crosses and selfs may be made with most varieties and that sterility is the exception rather than, as had been suggested by the work of earlier authors, the rule.

Another useful technique is the author's "bouquet method". Vines bearing flower buds about to open are cut and placed in nutrient solution or acidified water in a lath house, where they develop roots in a few days. They continue to flower and produce seed and the set is much higher than in similar plants left in the field. The method is most useful in midsummer and for use in the greenhouse in the autumn.

## FIBRES 633.5

487. Brown, H. B. 633.51:575(76.4)
**Registration of improved cotton varieties, II.**
J. Amer. Soc. Agron. 1940 : **32** : p. 83.

One new variety, Texacala, was approved for registration and is described. It is a selection of Acala previously known as Rogers Acala III and was made by J. H. McDonald. It is very uniform, gives excellent yields, especially under slightly arid conditions, has a staple length of $1\frac{1}{32}$ to $1\frac{1}{8}$ inches with a lint percentage of 34–38 and is somewhat earlier than other Texas big boll varieties.

488. Faria, C. V. de Oliveira 633.51:575(81)
Escola de Agronomia do Nordeste. Serviço de melhoramento do algodão na Paraíba. (**School of Agronomy for the North East. Cotton Breeding Service at Paraíba**).
Sec. Agric., Com., Viação Obras Púb., Brasil 1938 : Pp. 55.

A general outline is given of the work of seed control and of plant breeding; descriptions are given of the methods of mass and individual plant selection, of field experimentation and calculation of the results, and of the technique of lint studies.

The local cotton commonly known as Erbáceo Paraibano is very mixed and inferior in quality; the imported Texas is in a good state of uniformity and quality, but the selection H-105 made by G. C. Bolland at Ceará is still more promising and seems more suited to local conditions than the variety Texas.

Individual plant selections have been made in the varieties Texas, Express and H-105 on the basis of length and uniformity of lint and other fibre qualities; full data relating to the various plants selected are presented, showing the superiority of H-105 over the other two, especially under drought and other bad weather conditions.

In respect of yield, lint index, mean weight of 100 seeds and number of bolls per kg. the differences were statistically significant. Some of the Texas selections are also promising, having yielded 296 kg. per ha. more than the standard and given a lint percentage of 38·9, with a lint index of 7·7, the lint being exceedingly uniform in length.

489. Hutchinson, J. B. 633.51:575:578.08
**Some problems in applied genetics.**
Chronica Botanica 1939 : **5** : 403–04.

In breeding cotton, selection is at first the most effective method and replicated progeny row testing is a valuable aid. As the variability of the populations decreases, selection becomes ineffective and hybridization must be resorted to. Inter-family crosses are often of great use in restoring variability, especially if careful records have been kept of the relationship of different lines derived from the same original source. For wider crosses, studies of varietal and specific differences can be a valuable aid.

A study of varietal mixtures may lead to valuable information on the causes of degeneration in pure strains.

In introducing new types, e.g. American cottons to India or Africa, a highly variable stock should be imported and grown for a long time to allow acclimatization to take place.

490. Hutchinson, J. B. and
Silow, R. A. 633.51:575.11:001.4
**Gene symbols for use in cotton genetics.**
J. Hered. 1939 : **30** : 461–64.

A list of symbols for cotton genes, which it is proposed should be adopted as standard, is given. Genes in Old World ($2n = 26$) cottons are given italicized symbols while genes believed to be similar in New World cottons ($2n = 52$) are given the same symbols but are not italicized until their identity has been genetically demonstrated.

491. 633.51:575.14–181.12:581.49
Humphrey, L. M. 633.51:519.241.1:581.6
**A preliminary report of the effects of inbreeding in cotton with special reference to staple length and lint percentage.**
Genetics 1940 : **25** : 121–22. (Abst.).

The production of inbred lines of cotton varieties was started at the Arkansas Experiment Station in 1936. Of ten varieties now being inbred, five showed a highly significant negative correlation between staple length and lint percentage, while there was no significant correlation in the other five.

Statistical studies on lint percentage and staple length show that the inbred lines become highly uniform after three or four generations of inbreeding, with no further significant increase in uniformity up to eight generations.

492. Tavares, H. 633.51:575.42:578.08:633.85
O indice de oleo nas seleções do algodão. (**The oil index in cotton selections**).
Bol. Sec. Agric., Pernambuco 1939 : **4** : 168–74.

The "oil index" is calculated by adding the percentage of kernel to the percentage oil content of the kernel. This index was found to be correlated positively with kernel percentage and weight of one boll, but not with size of seed, lint length or lint index. A slight negative correlation existed between the oil index and lint percentage and a certain negative correlation was evident between kernel percentage and lint percentage, though the figures were not significant.

It is concluded therefore that by selecting seeds with thin seed coats—consequently a high kernel percentage—it should be possible to raise the oil content without prejudice to the lint.

493. 633.52:575(62)
Kilany, M. A. El 633.854.54:575(62)
**(Flax in Egypt. Part 1. Research and culture).**
Bull. Minist. Agric., Egypt 1939 : No. 204 : Pp. 36.

Three flax varieties, Normandy Nabatat, Giza Oil and Giza Purple have so far been released by the Egyptian Ministry of Agriculture. Many other promising strains and new hybrids are under trial.

494. Nagao, S. 633.52:575.127.2:576.356.5:576.354.4
**(Cytogenetic studies on the genus *Linum*. I. Conjugation of chromosomes in the hybrids of perennial *Linum* species).**
Commemoration Papers on Agronomy Prepared in Honour of Professor Masao Akemine on the Occasion of the Thirtieth Anniversary of His Academic Service by his Friends and Pupils, April, 1938 : 113–19.

In the $F_1$ hybrid of *Linum perenne* ($n = 9$) and *L. alpinum* ($n = 18$) trivalents, bivalents and univalents were observed at meiosis. The number of trivalents was variable, two to four being commonly observed.

It is concluded from the above results that *L. alpinum* is an autotetraploid species.

495. Poperekov, M. 633.52–2.4–1.521.6:575(47)
**(Achievements of Soviet science in the field of flax breeding).**
Len i Konoplja (Flax and Hemp) 1939 : No. 8 : 16–17.

Demonstrations at the Soviet Agricultural Exhibition included a number of new flax varieties improved in yield and quality; the more recent varieties are resistant to rust, some also to *Fusarium* (e.g. the hybrid variety G-651–3–1).

496. Mackay, E. L. 633.522:576.312.332
**Sex chromosomes of *Cannabis sativa*.**
Amer. J. Bot. 1939 : **26** : 707–08.

A heteromorphic pair was found in male plants of *C. sativa* collected from two wild populations in Wisconsin and one cultivated variety. It is concluded that the presence of such a pair is probably universal in the species.

497. 633.522:576.356.5:575.255:581.43
633.522:576.312.332
Postma, W. P. 633.522:576.356.5:581.04
**Some remarks on the cytology of normal and colchicine-treated hemp-plants. (*Cannabis sativa* L.).**
Rec. Trav. Bot. Néerland. 1939 : **36** : 672–76.

The roots of hemp plants have a diploid plerome, while the periblem is tetraploid in most cases. This is due to the occurrence of a chromosome division which is not followed by separation of the daughter halves, and not to fusion of nuclei as had been supposed by Breslawetz (1926).

Each diploid chromosome set in the plants examined contains only one satellited chromosome. It is therefore considered likely that this is a sex chromosome.

Chromosome doubling in *C. sativa* was successfully induced by colchicine treatment. Octoploid cells were found in the periblem of treated plants. One metaphase plate of the plerome had the triploid number of chromosomes (30), including two with satellites. The physiological effects of colchicine treatment are discussed (cf. "Plant Breeding Abstracts", Vol. X, Abst. 180).

498. Rybin, W. A. 633.522:576.356.5:581.04
Erzeugung von Tetraploiden Pflanzen beim Hanf durch Colchicinbehandlung.
**(Production of tetraploid plants in hemp by colchicine treatment).**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 586–91.

Young seedlings were immersed for 24 hours in 0·05 0·1 per cent colchicine solutions. After 18–20 days leaves with characteristic differences appeared and both male and female plants in which the flowers were distinctly larger were obtained. Two such plants were placed side by side. The seeds produced from the main stem of the female plant were twice the size of those from the side stems. Seedlings from the small seeds had $2n = 20$ and those from the large seeds proved to be tetraploid with $4n = 40$. In these seedlings the cells of the periblem were mainly octoploid.

All the tetraploid plants were female. They set a number of seeds when pollinated with normal pollen.

Certain other plants from the treatment had the appearance of being octoploid, their cells, hairs and stomatal cells being larger even than in the tetraploids. They were all dwarf and deformed.

499. 633.523:575(62)
633.524.3:575(62)
KILANY, M. A. El 633.524.34:575(62)
**(Jute and kindred fibres in Egypt. Research and culture).**
Bull. Minist. Agric. Egypt 1939 : No. 215 : Pp. 26.

Samples of Indian jute seed of both species (*Corchorus capsularis* and *C. olitorius*) were imported into Egypt in 1926. These proved to be mixed and from them three pure line selections have been developed, Olitorius Giza Green, Capsularis Giza Green and Capsularis Giza Red. Trials have shown that the *C. olitorius* type is best suited to Egyptian conditions. Three pure line selections of *Hibiscus cannabinus* (Deccan hemp or teel) have also been established.

Two types of *Abutilon Avicennae* (Manchurian jute) were introduced, one from Russia and one from China. Of these the Chinese type is the more promising, but a hybrid between them has yielded a type with the earlier maturity of the Russian and the greater vigour of the Chinese variety.

Experiments have also been conducted with ramie (*Boehmeria nivea*), sunn-hemp (*Crotalaria juncea*) and true hemp (*Cannabis sativa*).

500. TORRES, J. P. and
GARRIDO, T. G. 633.526.1:575(91.4)
**Progress report on the breeding of abacá (*Musa textilis* Née).**
Philipp. J. Agric. 1939 : **10** : 211–32.

Of 54 different abacá (Manila hemp) crosses made in 1928–31, 29 were successful. Owing to changes in personnel and organization of the Philippine Bureau of Plant Industry, the seedlings obtained were much neglected and plants of only five families remain for selection to be carried out.

In 1931 27 more crosses were made. Of these ten were successful, five failing because of the complete sterility of the variety Canton, and four producing seed that failed to germinate. Some 10,000 hybrid seeds were grown in 1932 and in subsequent years nursery selection of the most vigorous plants reduced the number of seedlings to 100, which are being clonally propagated and tested further. Of these, 39 are now being tested for resistance to abacá bunchy-top disease and it is hoped to test the remainder at an early date.

Seedlings of the variety Maguindanao, which is itself undesirable owing to a weak root system which makes it susceptible to wind damage, are particularly promising and have much stronger root systems than the parent. It is hoped that Maguindanao x Putian hybrids will in addition inherit the bunchy-top resistance of Putian.

The $F_1$ abacá seedlings under observation exhibited heterosis and produced 47 to 85 per cent more suckers than either parent.

501. GARRIDO, T. G. 633.526.23:575.127.2:633.526.24(91.4)
**Results of sisal and maguey hybridization.**
Philipp. J. Agric. 1939 : **10** : 233–48.

Attempts to cross *Agave cantala* ♀ with *A. sisalana* ♂ were unsuccessful, but the reciprocal cross gave 12 seeds from 500 flowers pollinated. From these seeds, one hybrid plant was raised. This hybrid appeared to be more vigorous than either parent. It had fibre much stronger and slightly more elastic than *A. cantala*, and almost equal to that of *A. sisalana*. Morphologically it was intermediate between the two parents. The hybrid is being propagated vegetatively for further tests.

## SUGAR PLANTS 633.6

502. BRANDES, E. W. 633.61–2.111–1.521.6:575.127.2(73)
**Three generations of cold resistant sugarcane.**
Sug. Bull., N.O. 1939 : **18** : No. 4 : 3–5.

ANONYMOUS.
**Science marches on.**
Ibid 1939 : **18** : No. 4 : p. 1.

Crosses between cold-resistant canes from the area between the Caspian Sea and western

China and commercial sugar canes were made by transporting pollen and flowering stools from the United States to South America, this method being made necessary by the wide difference in flowering date between the parents. This material was back-crossed to the commercial canes in Colombia and a third generation, obtained partly by a second back-crossing, is now being raised. Many of these canes are of useful agronomic type and have shown appreciable cold resistance. The second back-cross was in part obtained in southern Florida, the parents being induced to flower together by controlling the length of day. The aim of the work is to obtain canes which are cold resistant and which have the ability of the wild parent to grow vigorously in cool weather in early spring, for use in the Gulf areas of the United States.

The second article, an editorial comment on the above work, appraises the achievements of sugar cane breeding in the United States.

503. 633.63:575.12:633.416

Les croisements de sucrière et de fourragères. (**Crosses of sugar and fodder beets**).

Publ. Inst. Belge Amélior. Better. 1939 : **7** : 332–33.

The first generation had in the main red or orange coloured roots, though some whites also appeared. The shape was intermediate between that of the sugar beet and the fodder beet. The sugar content was slightly higher than that of the parents. It was difficult to determine which parent was dominant.

Some results in $F_2$ are given. The author concludes that possibly selection in such material as he used may lead to the production of a type slightly different from the original and sufficiently homogeneous but that there are no grounds for supposing it superior to the existing types.

504. Lanjouw, J. 633.682:575.127.2:581.192

**Two interesting species of *Manihot* L. from Suriname.**

Rec. Trav. Bot. Néerland. 1939 : **36** : 543–49.

Two species, *M. saxicola* (sp. nov.) and *M. melanobasis* Müll. are described. The former was found in the mountains of Surinam; it gives a low yield of storage roots but they are exceptionally rich in protein (more than 10 per cent of the dry weight). The species has been crossed reciprocally with the cassava variety Basirao in an endeavour to breed a high-yielding commercial form with the high protein content of *M. saxicola*.

505. Whitney, L. D.,
Bowers, F. A. I. and
Takahashi, M. 633.689(96.9)

**Taro varieties in Hawaii.**

Bull. Hawaii Agric. Exp. Sta. 1939 : No. 84 : Pp. 86.

Descriptions are given of 84 distinct varieties of taro (*Colocasia esculenta*), most of them native Hawaiian forms; these varieties are believed to include all or nearly all those at present in cultivation in Hawaii. A key for the identification of 74 of the varieties is also provided. Experiments have recently been made in Hawaii to improve the taro both by hybridization and by selecting bud mutants.

## STIMULANTS 633.7

506. Gisquet, P.,
Dusseau, A. and
Hitier, H. 633.71:575.127.2

Premier hybride stabilisé en une variété nouvelle, issue du croisement *Nicotiana Tabacum* var. *purpurea* x *N. sylvestris*. (**First hybrid stabilized into a vew variety, derived from the cross *N. Tabacum* var. *purpurea* x *N. silvestris***).

C.R. Acad. Sci., Paris 1939 : **209** : 356–57.

The *N. Tabacum* var. *purpurea* used in this cross with *N. silvestris* ($2n = 12_{II}$) was a monosomic form ($2n = 23_{II} + 1_{I}$). The $F_1$ showed general dominance of the *purpurea* characters

and heterosis, but was almost sterile. Some good seed was, however, obtained by selfing and 13 successive generations were successfully raised. The $F_2$ segregated for earliness, height, shape and colour of leaves and flowers. . Anomalies in the last two structures indicated chromosome irregularities even in plants that survived. By continuing selfing in each generation a more and more homogeneous and fertile population was obtained indicating that unpaired chromosomes were being gradually eliminated in the course of the successive meioses and stable genotypes were being formed. A strain 51–44 appears to breed true for various features which are characteristic of *N. Tabacum*. Sporogenesis in $F_{11}$–$F_{13}$ of this strain showed no irregularities and the haploid chromosome number was 24. Other similar strains are being studied.

507. Tikhvinskaja, V. D. 633.71:575.127.2:581.192.6

**Some data on inheritance of chemical composition by hybrids between *N. tabacum* and *N. glauca*.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 791–93.

The $F_1$ hybrid of *N. Tabacum* and *N. glauca* approached the *N. Tabacum* parent in content of total nitrogen and of protein nitrogen. Samples were taken on the appearance of the first flower and 10 and 20 days later. During this period the total and protein nitrogen content decreased in both hybrid and parents. With respect to alkaloids, the hybrid resembled *N. glauca*. Nicotine content was low and decreased during the period of testing, whereas in *N. Tabacum* it was initially high and increased. Total alkaloid content of the hybrid closely corresponded to that of *N. glauca* and increased similarly during the period of test. The alkaloid of the hybrid was presumed to be that of *N. glauca*, anabasine.

508. 633.71:576.356.5:575.129:581.04

Warmke, H. E. and 576.356.5:001.4

Blakeslee, A. F. 576.356.5:581.04:578.08

**Induction of simple and multiple polyploidy in *Nicotiana* by colchicine treatment.**

J. Hered. 1939 : **30** : 419–32.

Chromosome doubling was induced by colchicine treatment in *Nicotiana Sanderae* and in the sterile $F_1$ hybrids *N. Tabacum* x *N. glutinosa* and *N. glutinosa* x *N. silvestris*.

The formula is given of an emulsion spray containing colchicine which proved more effective in treating shoots than a solution in water. Of 39 plants thus sprayed, 12 per cent gave branches with doubled chromosome numbers.

The characters of the doubled forms produced are described. Efforts are being made to produce more complex hybrids containing a diploid chromosome complement from each of three or four species.

A new nomenclature for synthetic polyploids is proposed. If we represent the chromosome complements of four diploids as *AA*, *BB*, *CC* and *DD*, the following terms are suggested: *AB*, *AC*, etc., double haploid; *AABB*, *AACC*, etc., double diploid (= amphidiploid); *AAAABBBB*, etc., double tetraploid; *AABBCCDD*, quadruple diploid, and so on.

509. 633.71:576.356.5:581.04

633.71:576.356.5:581.039

Bartolucci, A.

Il fenomeno della poliploidia ed il tabacco. 1ª nota—L'uso della colchicina e della centrifugazione dei semi per trasformare gl'ibridi sterili in ibridi fertili. (**Polyploidy and tobacco—Sterile hybrids made fertile by colchicine and centrifuging treatments**).

Boll. Tec. Tab. 1939 : **36** : 141–48.

Reference is made to a sterile hybrid of *Nicotiana Tabacum* x *N. tomentosa* with $2n = 36$ which suddenly became fertile as a result of spontaneous chromosome duplication.

By centrifuging and by application of colchicine duplication has been induced in sterile hybrids of *N. Tabacum* x *N. silvestris* and *N. Tabacum* x *N. glauca*. The colchicine method is thought to be the more practicable of the two.

510. Cooper, D. C. and Brink, R. A. 633.71:581.162.5:581.483:575.127.2 633.71:581.162.5:581.483:575.127.5
**Somatoplastic sterility as a cause of seed failure following interspecific hybridization.**
Genetics 1940 : **25** : p. 114. (Abst.).

Fertilization occurs between 50 and 60 hours after pollination in the crosses *Nicotiana rustica* x *N. glutinosa* and reciprocal, *N. rustica* x *Petunia violacea* and *N. glutinosa* x *P. violacea*, but the ovules collapse at an early stage. The cause of this collapse is "somatoplastic sterility" of the type described in *Medicago sativa* (cf. Abst. 468 above); the weakly developing endosperm is unable to compete with the nucellar tissue, which becomes meristematic instead of regressing. Seed development is normal in self-pollination of *N. rustica* and *N. glutinosa*.

511. Krug, C. A., Mendes, J. E. T. and Carvalho, A. 633.73(81)
Taxonomia de *Coffea arabica* L. Descrição das variedades e formas encontradas no Estado de São Paulo. (**Taxonomy of *C. arabica* L. Description of the varieties and forms occurring in the state of São Paulo**).
Bol. Téc. Inst. Agron., Campinas 1939 : No. 62 : Pp. 57.

The first stage of the breeding work with coffee in São Paulo consisted in collecting and examining all the local types in cultivation, whereby a large type collection has been established; all the trees in it have been subjected to detailed examination. The characters studied and the method of examination are elaborated and detailed descriptions are then given of the individual types, with indications of the chromosome number, commercial qualities and origin of each form, and any genetical results that have been obtained with it. Existing synonyms are also mentioned. A diagnostic key to the botanical varieties is provided and each is illustrated in excellent photographic reproductions, many of them in colour.

512. Krug, C. A. and Carvalho, A. 633.73:581.48:575.11
Prova genética da existência de endosperma na semente de café. (**Genetical proof of the existence of endosperm in the coffee seed**).
J. Agron., S. Paulo 1939 : **2** : 381–84.

This is the Portuguese version of the paper referred to in "Plant Breeding Abstracts", Vol. X, Abst. 44, adducing further evidence of the endospermic nature of the coffee seed (cf. "Plant Breeding Abstracts", Vol. X, Abst. 19).

513. Ostendorf, F. W. 633.74:581.162.5:581.162.3
De bloeislaging van de cacao. (**Fruit setting in cacao flowers**).
Bergcultures 1939 : **13** : 1539–44.

The findings of Pound, Voelcker and Posnette on self-fertility and self-sterility in cacao are discussed.

Tables of results of self-pollinations of the Djatiroenggo clones undertaken in Java showed that out of 20 clones only one, DR 1, was self sterile and the other 19 may be regarded as self-fertile. The number of fruits set in the latter group varied in the different clones and in the same clones from pollinations on different days. Various environmental factors may, it is believed, be responsible for such discrepancies which must not at the present stage of investigation be attributed to varietal differences.

The self-sterility of DR 1 implies that all fruits from this clone must arise by cross-pollination. Now, the oldest DR 1 buddings at Djatiroenggo are situated in monoclone blocks of 10 × 5 trees and give a good yield. It must therefore be assumed that many flowers are pollinated by pollen from self-fertile trees at a distance, sometimes over 10 metres, from the monoclone planting. Having considered Sakel's research on methods of pollen transference, the writer concludes that, in the case of DR 1, it seems likely that wind and/or winged insects must play an important part in pollination and the writer is inclined to regard anemophily as the most plausible theory.

Whatever the agent (or agencies) in pollen transference in cacao may be it is apparently effective judging by observations in Java and Trinidad.
In attempting to improve production the aim should be not to try to increase the set of flowers ultimately forming fruits but to prevent the dropping of unripe fruits.
In selecting mother trees productivity is the first consideration, and self-sterility or self-fertility a secondary matter. For seed production, however, seed must be obtained from self-sterile mother trees by artificial pollination with pollen from other self-fertile mother trees. A warning is given against the planting of monoclone blocks of clones that are known or may possibly turn out to be self-sterile. On the other hand, DR Nos 2, 18, 34, 38 and 41 can be regarded as self-fertile and may safely be planted in monoclone blocks—even though differences may ultimately be found between their performance when selfed and when crossed.
A discussion followed the paper.

514. HOED, F. and ELSOCHT, P. 633.79.0014(49.3) 633.79–1.524(49.3)
Etude sur les variétés de houblon—résumant les recherches entreprises en 1938 par le Cercle d'Etudes et de Recherches pour l'Amélioration du Houblon. (**Study of the varieties of hops—summarizing the investigations undertaken in 1938 by the Club for Studies and Research for Hop Improvement**).
Petit J. Brass. [1939] : No. 1044 : Pp. 7.

A critical survey of the performance for 1938 of hop varieties, including many imported from various countries in Europe and Russia is accompanied by tables showing in detail the results of the analyses of the various features determining quality, yields, etc.
The promising types already found in material from Lorraine and Austria again did well and the hybrids No. 67 L.V.D. and No. 5 L.V.D. also gave good results.

## AROMATIC PLANTS 633.8

515. BEREZINA, N. 633.812:581.162.5:578.08
(**How to obtain a fertile form of *Pelargonium roseum* Willd. by the method of Jorgensen and Winkler**).
Trudy Vsesojuznogo Instituta Efirnomasličnoi Promyšlennosti (Transactions of the All-Union Institute of the Essential Oil Industry) 1936 : No. 5 : 112–22.

In view of the importance of polyploid forms as a source of new varieties of normally sterile plants experiments were made using the well-known technique of Jorgensen and Winkler with the object of producing polyploid forms of the pink commercial geranium, the Šromovskaja variety, the Kuzner variety, and a mutant called No. 5.
Out of 600 plants of the first of the above groups 138 regenerated shoots were obtained, and of these eight were tetraploids with 144 chromosomes. In two aberrant forms examined, the chromosome number was apparently normal: it is however possible that chromosome aberrations such as translocation may have been present, though indiscernible owing to the smallness and large number of similar chromosomes present.
By the callus method 664 shoots were obtained, including three tetraploids and, as before, two morphologically aberrant forms with the normal chromosome number.
A further attempt was made to obtain tetraploids from the callus formed at the base of the stem of a rooted leaf cutting, but, in spite of the large size of the callus and the ease with which roots and shoots are formed in such cases by the pink commercial geranium, no tetraploids nor aberrant forms were obtained.
The tetraploids in these experiments were larger and had coarser stems and showed more pronounced crinkling of the leaves and produced larger buds and flowers, as compared with the original form. They were also fully fertile. The pollen grains however differed in size and 30–40 per cent of them were aborted. Pollination of the diploid with tetraploid pollen gave no set.
The floral biology of the tetraploid was studied. Germination is normal but slow. The 300 plants raised from tetraploids showed marked heterosis.

From the tetraploid forms produced 2,135 seeds have already been obtained.
The economic qualities of the new fertile form are to be studied.
The experiments with the other two varieties and the mutant failed to produce any tetraploids.

## OIL PLANTS 633.85

516. Sessous. 633.85:575(43)
Fortschritte in der Züchtung fettliefernder Pflanzen. (**Progress in breeding fat yielding plants**).
Mitt. Landw. 1939 : **54** : 812–13.

The oil content of most oil seed plants is very much influenced by environmental factors and special account must be taken of this in making selections. High oil content is frequently associated also with high protein content in sova bean and linseed and in other plants the same association may perhaps also be found.
Other features in which improvement may be achieved through breeding are winter-hardiness, standing capacity and freedom from shattering.
White lupin, safflower, poppy and sova bean are mentioned as plants with which much progress has been made in producing forms of improved oil content suitable for local cultivation.

517. Ermakov, A. I. 633.85:581.6:578.08
(**A universal and quick method for refractometric determination of oil in seeds**).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 18 : 27–34.

The method consists in dissolving the oil in the powdered seed in α-monobromnaphthalene and measuring the alteration in its refractive index. Tables are given for converting this into the percentage oil content. The results obtained by the method are in general agreement with those given by the Soxhlet apparatus.

518. Sebto, A. G. and
Gilev, M. I. 633.853.55:575"793"
(**An early variety of the castor oil plant for the littoral region**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : p. 25.

A new selection named Budennovka, characterized by exceptionally early maturity, has been selected from a wild Chinese form. When sown between the 15th and 20th of May it is fully ripe by late September; the seeds have a high oil content.

519. Doná dalle Rose, A. 633.854.54:575(45)
Tre razze di lini da olio Marsic I—Capace—Bianco Nano. (**Three races of linseed, Marsic I—Capace—Bianco Nano**).
Ital. Agric. 1939 : **76** : 845–49.

All three varieties are early in maturity and very high yielding. Marsic I is a selection from a population obtained from Morocco, Capace from a South American population and Bianco Nano 'White Dwarf' from a strain received from Argentina. Descriptions are given of the varieties, including data on their yield of oil and iodine numbers.

520. 633.854.78:575.127.2:635.24
Marčenko, I. I. 633.854.78–2–1.521.6:575.127.2
(**Ways of producing perennial and tuberous sunflowers**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 7 : 37–39.

In hybridization experiments between annual and perennial *Helianthus* species 8 hybrids have been obtained between the sunflower and Jerusalem artichoke *H. annuus* x *H. tuberosus*, 31 of *H. annuus* x *H. macrophyllus*, 20 of *H. annuus* x *H. subcanescens*, 22 of *H. cucumerifolius* x *H. macrophyllus*, 2 of *H. cucumerifolius* x *H. subcanescens*, 1 of *H. subcanescens* x *H. argophyllus*.
The $F_1$ hybrids were self-sterile; 307 hybrids were obtained by crossing the hybrids with *H. annuus* and 834 by crossing the $F_1$ hybrids among themselves. These hybrids showed

wide variation, from the sunflower type to the exclusively tuberous, including a number of new types; only 67 of them were fertile and 46 third generation plants were obtained, most of which were fertile and included several perennial forms. The fertility varied with conditions of growth.

The $F_1$ plants were entirely free from *Orobanche* (race B) and rust and some of the third generation plants displayed resistance to one or other or both parasites. Most of the later generation plants were without tubers.

## MEDICINAL PLANTS 633.88

521. Stoffels, E. H. J. 633.885.1:575(67.5)
Le quinquina. (**Cinchona**).
Publ. Inst. Agron. Congo Belge 1939 : Sér. Tech. No. 24 : Pp. 51.

This bulletin on cinchona and its cultivation contains reference to experimental work at Mulungu, Belgian Congo. Analytical data on the cinchona collection at the station are tabulated. Of 290 vigorous trees of *Cinchona Ledgeriana*, eight gave more than 11 per cent of quinine base, 31 gave more than 10 per cent and 59 more than 9 per cent. Detailed data on 20 selected trees are presented. The aim of the breeding work is to produce élite seed rather than selected clones, which suffer from the disadvantage that they are grafted on *C. succirubra* or *C. robusta*, which both have root systems with only a third of the quinine content of *C. Ledgeriana*. The method to be adopted is to establish isolated seed gardens of the vegetative progeny of superior trees.

522. Oudot, G. 633.885.1:575.42(92+59.7)
Notes sur le quinquina (extrait du compte rendu de mission aux Indes Néerlandaises de M. G. Oudot, ingénieur des travaux d'agriculture de l'Indochine). [**Notes on cinchona (extract from the report of the mission of G. Oudot, agronomist in French Indo-China, to the Netherlands East Indies)**].
Bull. Écon. Indochine 1939 : **42** : 777–88.

Anonymous
Note sur la culture du quinquina aux Indes Néerlandaises. (**Note on the cultivation of cinchona in the Netherlands East Indies**).
Agric. Élev. Congo Belge 1940 : **14** : 10–11.

In the Netherlands East Indies selection work on cinchona aims at the production of (1) new and superior clones from improved types obtained by hybridization or self-pollination of outstanding clones and (2) improved progeny and finally pure lines that shall be highly productive, resistant to diseases—especially diseases of the root—and suitable for use for plantations.

Among the best clones at present are Tjibeureum 5, Tjinjiroean 1, Kertamanah 63 and W3. Tjibeureum 5 surpassed the other three clones in both quinine content and yield per tree, averaging 14 per cent of quinine sulphate in the bark of the trunk and 10·7 per cent from the bark of the trunk, branches and roots. This clone in a plantation has given 100 kg. of quinine per annum since its first year.

New clones derived from Tjinjiroean 1, Kertamanah 63, W3 and R.G.I. are in the early stages of being tested and it has been stated that some of them appear likely to yield quinine 30 per cent and more in excess of the clones at present in use. Tests of mixed plantations of selected clones (derived from plants raised from seed) of Wanasari 119 with W3 and Wanasari 133 with R.G.9 are being tested.

Some very promising results are recorded as regards yield of quinine sulphate per hectare and from the clones Tjinjiroean 1, K63, W3, R.G.I. and M.R.G., K63 (grown on its own roots) yielding 168 kg., R.G.I. 145 kg. and W3 132 kg.

As regards quinine content R.G.I. (on its own roots) surpassed even M.G.R. which had hitherto been regarded as unlikely to be equalled; and Tj.I and W3 were almost equal to M.G.R.

In French Indo-China the cultivation of cinchona is hampered by disease but research on the production of resistant types is proceeding.

The writer suggests that investigations should also be begun with wild or, as far as possible, unselected material from which selection carried out in Indo-China should ultimately produce types well adapted to conditions there. The possible difficulty of obtaining the initial material for such development is mentioned.

## RUBBER PLANTS 633.91

523. 633.912:581.143.7:581.165.711:581.165.1(92.2)

Aanbevolen *Hevea*-plantmateriaal 1939/40. (**Recommended *Hevea* planting material 1939-40**).

Bergcultures 1939 : **13** : 1641–46.

Recommendations based on observations from West, Central and East Java. The performance of the various clones and seedlings is recorded for particular districts. Advice is also given on seed for raising plants for use as stocks.

524. 633.912:581.165.1:575(67.5)

Travaux de la Division des Hevea de l'Inéac. (**Work of the Hevea Division of the INEAC**).

Agric. Élev. Congo Belge 1940 : **14** : 8–10.

A progress report by Mons. Ferrand on the mother clones, clones, and seedlings from the Netherlands East Indies, seed collection, plantations, etc., at the Institut National pour l'Etude Agronomique du Congo Belge.

Among the clones showing a marked increase in yield at the beginning of their second tapping year were Tj.I which gave 21 25 grm. per tapping day in the first three months of tapping; AV.152 which gave 17 18 grm.; Y 217 45 which gave 18 grm. (in April); and AV.49 (planted 1933) which gave 10–13 grm. on poor soil.

In the third tapping year Y 75 43 gave an average of 19–23 grm. per tree per day, AV.49 (planted 1931) gave an average of 24 grm. in its fourth year.

Among the seedlings from the Netherlands East Indies (1932) thirteen derived from AV.80, BRI, AV.50 and AV.152, showed a considerable increase in output.

It has been possible to lay down a nursery of twin plants comprising AV.50 and AV.163 and numerous seeds from Y 229 have also been collected for the nursery.

Among the seedlings of known origin planted in the first half of 1939 are Tj.I, Y 217/45, Y 75/43 and Y 78/47.

## FRUIT TREES 634

525. Lind, E. 634:575(43)

Intryck från en studieresa i Tyskland, Frankrike och England. (**Impressions from a study tour in Germany, France and England**).

Sverig. Pomol. Fören. Årsskr. 1939 : **40** : 108–22.

The Kaiser Wilhelm Institute at Müncheberg was visited by the writer who here records some of its work on fruit improvement, which includes investigations on the production of apples resistant to scab (*Venturia inaequalis*) by crosses with wild types and of scab-resistant pears by the same method; plums combining the earliness, frost resistance, productivity and hardiness of the "Anatolian plum" with the quality of superior types; *Monilia* resistant cherries from crosses between sweet and morello types; disease resistant bush fruits and strawberries.

526. 634:575(72.98)
63.00.15(72.98)

**Research on fodder crops and pastures. Imperial College of Agricultural Research, St. Augustine, Trinidad.**

Chronica Botanica 1939 : **5** : p. 490.

This account of the work in progress at the College includes reference to breeding work on bananas and cacao, work which has been dealt with at greater length from time to time in "Plant Breeding Abstracts".

527. NILSSON, F. 634:575(73+48.5)
Odling och förädling av fruktträd och bärbuskar i U.S.A. Berättelse över en studieresa 1937-1938. (**Cultivation and improvement of fruit trees and bush fruits in U.S.A. Report on a study tour 1937-38**).
Sverig. Pomol. Fören. Årsskr. 1939 : **40** : 7–80.

Though mainly of interest to horticulturists, this report includes observations on the development of new varieties and improvement of quality by grafting and by selection and breeding; relevant genetical and cytological work in U.S.A. is mentioned. The main economic fruits such as apples, pears, peaches, apricots, citrus, berries of various kinds and nuts and their place in horticultural research in various states are discussed. The organization of the horticultural research done by the various government bodies and by experiment stations and other institutions is outlined in a critical summary in which both the relations between research and educational work and also the role played up to the present by cytological research in fruit improvement in the United States receive special attention.

In considering the outlook for developing the cultivation of fruit and berries in Sweden due recognition is given to the work of Johansson and Nilsson-Ehle, though it is evident that much still remains to be done especially with regard to apples in improving quality, disease resistance, keeping properties, hardiness, etc. The need for types which ripen earlier or later than the existing varieties and thus meet the market requirements in different districts is also stressed. The production of new disease resistant forms of strawberries, raspberries and other berries should occupy the Swedish breeder's attention as well as types suitable for cultivation in northerly regions. The cultivation and improvement of the Arctic raspberry, *Rubus arcticus*, which is tending to die out though formerly found abundantly under natural conditions is recommended. This species was (at the time of writing) being systematically improved at an experiment station in central Finland.

The possibility of raising early varieties of vines and peaches on a large scale should also be examined.

528. MEUNISSIER, A. 634:575.127
Résumé des travaux de la Section des Etudes Scientifiques pendant l'année 1937. (**Summary of the work of the Section of Scientific Studies for 1937**).
Bull. Soc. Nat. Hort. Fr., February 1938 : Pp. 21.

An outline is given by M. V. Evreinoff for the benefit of French readers of the work and achievements of I. V. Michurin, with a list of his various hybrids.

529. RIETSEMA, I. (Editor) 634:582
Vierde beschrijvende rassenlijst voor fruit 1938–1939. (**Fourth descriptive list for varieties of fruit 1938-1939**).
Published by the Nederlandsch Algemeen Keuringsdienst (N.A.K.) Pp. 86.

This extremely useful little pamphlet contains in addition to descriptions of the varieties of fruits and berries cultivated in Holland a record of their distribution in the various climatic zones of the country, also information on new varieties recommended for trial and on varieties rejected for one reason or another as unsuitable for cultivation. Some particulars of root stocks for various fruit trees and of their value are also given.

Among the authorities quoted as sources of information are the author's own research, many Dutch and Scandinavian authorities, the East Malling Research Station, and various English and American publications.

The section on blackberries has been extended (as compared with previous editions) and the *Vaccinium* section is new.

A short but excellent glossary of various biological and genetical terms and a subject index grouped mainly under fruits add to the practical value of the booklet.

530. 634.11:575(75.5)
MOORE, R. C. 634.11–2.452–1.521.6:575.11
**Apple breeding program—cedar rust inheritance.**
Virginia Fruit 1940 : **28** : 163–66.

The apple breeding programme being carried out at the Agricultural Experiment Station, Blacksburg, Virginia is outlined. Some 3000 seedlings of crosses between the best present-day varieties are now on hand; a few of them are already bearing and the most promising of the other seedlings are being top-grafted on to older trees to hasten fruiting.
The following data on the inheritance of resistance to cedar rust (*Gymnosporangium* sp.) have been obtained: Jonathan x Rome Beauty gives only susceptible progeny, while the progeny of Arkansas Black x Mother and Arkansas Black x Delicious are all resistant. It therefore seems that Arkansas Black is homozygous for rust resistance. Winesap x Jonathan and Winesap x Rome Beauty give 1 : 1 ratios and Winesap x Delicious gives a 3 : 1 ratio of resistant to susceptible progeny.

531. TICHONOVA, A. S. 634.11:575.127.2
**(Studies on the open pollinated seedlings of the late I. V. Mitchurin's apple varieties).**
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1938 : No. 6 : 24–30.

Descriptions are given of a number of seedlings obtained by open pollination from two of Michurin's crab varieties and characterized by winter-hardiness, high yield and good quality.

532. KUZNETZOV, P. V. 634.13:575.127.2
**[The willow-leaved pear (*Pyrus salicifolia*) as initial form in hybridization work].**
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1938 : No. 6 : 31–33.

Such characters as resistance to drought, scab, frost and poor and salty soils make the species a promising source of rootstocks and breeding material and large numbers of crosses of it with cultivated pears have already been made. Some are of the cultivated type and thought to be promising.

533. RUBZOW, G. A. 634.13:576.16
**(Origin and evolution of the pear genus *Pirus* Tourn.).**
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 13 : 14–17.

Thirty-five species of pear are known to exist, constituting two distinct groups, the Eurasian and the Far Eastern. The distribution and characteristics of the various species are briefly outlined and certain characteristics indicating phylogenetic relationship between species belonging to the different groups are discussed. The oldest are thought to be the Chinese species. The species *P. Pashia* is regarded as a link between the relic species *P. Boissieriana* and *P. longipes* on the one hand and *P. Korshinskyi* on the other. The latter species is linked with the Iranian group—*P. glabra* and *P. salicifolia*—by *P. heterophylla* and with the Mediterranean species—*P. elaeagrifolia* and *P. amygdaliformis*—by *P. syriaca*.
The characters of the Chinese species—*P. serotina*, *P. betulaefolia*, *P. Calleryana*, etc.—and of *P. salicifolia* are dominant in crossing with *P. communis*, as are also the characters of *P. heterophylla*. Interspecific hybrids are found with great frequency in Central Asia and the Near East.

534. POJARKOVA, A. J. 634.2–1.524(5)
**[Critical review of the species of cherry belonging to the cycle of *Cerasi prostratae* (Labill.) Ser. of Central and Anterior Asia .**
J. Bot. U.R.S.S. 1939 : **24** : 225–46.

Seventeen species all closely related to *Prunus prostrata* have been found in Central Asia and the Near East and fall clearly into two series, the Incanae and the Amygdaliflorae, differing

in distribution. They are all highly xerophytic and as most of them bear fruit of relatively good flavour and are very prolific they are regarded as promising parents for crossing with the cultivated cherries. Allied species occur in similar habitats in the Mediterranean area and both are apparently tertiary relics, having acquired their xerophytic type in the course of evolution. A key for the determination of the species is given, followed by descriptions of them in Latin.

535. Evreinoff, V. A. 634.2–1.524.4
L'importance et la diversité du genre *Prunus* (au sens large) dans l'arboriculture fruitière. [**The importance and the diversity of the genus *Prunus* (*sensu lato*) in horticulture**].
Rev. Hort., Paris 1939 : **26** : 540–42.

Indications are given of the wide range of forms as regards such characters as season of maturity, hardiness and disease resistance existing in the peach, plum, cherry, apricot and almond groups, with special reference to the value of some of the wild relatives.

536. Crist, J. W. 634.23:575.247:581.13:581.162.5
**Photosynthetic studies of mutational barrenness in the Montmorency cherry.**
J. Agric. Res. 1939 : **59** : 547–53.

Barren, mutant branches of Montmorency cherry (cf. "Plant Breeding Abstracts", Vol. X, Abst. 215) had a lower photosynthetic activity at the time of fruit bud differentiation than normal branches. Chemical studies suggest that the mutant is barren because at the critical time of fruit bud initiation the photosynthetic activity of the plant is not sufficient to leave an excess of carbohydrates after satisfying the demands of vegetative growth.

## CITRUS FRUITS 634.3

537. Zorin, F. M. and
Patchev, A. G. 634.3:575.127.2
**(Plant breeding work with citrus fruits on the Black Sea Coast of the Caucasus).**
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : Nos. 5–6 : 63–73.

By growing under suitable conditions the satsuma (*Citrus Unshiu*) has been induced to form viable pollen and in 1935 hybrids were obtained between Unshiu and the kumquat. Pollen formation was particularly successful when growth vigour was suppressed, as for instance by transplantation. The number of seeds formed per fruit after cross-pollination was also increased by unfavourable growth conditions such as drought. By pollination with Natsu-Mikan a set of 7·2 seeds per fruit was obtained, though only 4·3 per cent of them proved to be hybrids. Pollination with the Turkish orange gave 1·6 seeds per fruit, 15·6 per cent of them being hybrids.

The hybrids sometimes display features not present in either of the parents. For instance a hybrid with the lemon had inverse-conical foliaceous wings at the base of the leaf lamina. All hybrids with tender species suffered from the frost but hybrids with hardy species such as *Poncirus*, *Fortunella* and *C. Coji* Marc. (Shiva Mikan) proved to be frost-resistant. The results are tabulated.

Hybrids with *P. trifoliata* had trifoliate leaves in the first year of growth but in the second and third years the leaves became entire and remained so in later years. By grafting a shoot of *P. trifoliata* above the main branch of the young seedlings (mentor) marked increases in hardiness were induced, together with a tendency towards evergreenness.

538. Lykov, T. G. and
Lykova, P. I. 634.3–2.111–1.521.6:575.127.2
**(Our citrus breeding plot).**
Soviet Subtropics 1939 : No. 11 (63) : 43–44.
Seedlings of *C. Unshiu* crossed with orange, lemon and kumquat, of kumquat crossed with lemon and of clementine with Shiva-Mikan and *C. Unshiu* are under examination. One hybrid of *C. Unshiu* x orange is distinguished by cultivated fruit type combined with great frost resistance.

## NUTS 634.5

539. Corsan, G. H. 634.51:575.127.2(71.3)
**Report from Canada.**
Rep. Proc. 29th Annu. Mtg Nth. Nut Gr. Ass., Mass. 1938 : 12–14 September : 102–03.
Six natural hybrids of Japanese heartnut (*Juglans cordiformis*) x butternut (*J. cinerea*) are reported. They are very hardy, of outstanding vigour and have nuts that ripen early and so escape early October frosts. Their nuts are of excellent quality with thin shells and the hybrids are considered to be the best *Juglans* type so far known for growing in the northern United States.

540. 634.52:575.42(73)
Reed, C. A. 634.52:575.127.2
**Varieties of hickory for New England.**
Rep. Proc. 29th Annu. Mtg Nth. Nut Gr. Ass., Mass. 1938 : 12–14 September : 36–43.
Sixty varieties of hickory are listed and 24 described in more detail, with particulars of their origin. These include interspecific hybrids of pecan x bitternut and shagbark x bitternut.

541. 634.52–2.111–1.521.6:575.127.2(74.7)
Smith, G. 634.51:575.127.2(74.7)
**Nut trees at Wassaic State School - Notes on breeding nut trees.**
Rep. Proc. 29th Annu. Mtg Nth. Nut Gr. Ass., Mass. 1938 : 12–14 September : 87–89.
Breeding work is being conducted by the author in New York State on several nut-bearing trees. Hybrids of northern pecans with outstanding hickory trees have been made in order to obtain hybrids that can be grown in the northern United States. Other *Carya* hybrids are also recorded.
Heartnut and heartnut x butternut (*Juglans cinerea*) hybrids have been made. It is hoped to produce trees bearing nuts of good cracking quality with a flavour resembling the butternut, and also possibly to increase the hardiness of the trees.
Two American chestnut (*Castanea dentata*) trees that have so far escaped blight have been crossed together and also crossed to *C. crenata* and to blight-resistant types supplied by Graves of the Brooklyn Botanic Garden.

542. Wood, M. N. 634.551:575(79.4)
**Two new varieties of almond : the Jordanolo and the Harpareil.**
Circ. U.S. Dep. Agric. 1939 : No. 542 : Pp. 13.
A further account of the almond varieties referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 851.

543. Higgins, B. B. 634.58:581.48:575.113.6:575.113.4.061.6
**Inheritance of seed-coat color in peanuts.**
Amer. J. Bot. 1939 : **26** : p. 4s. (Abst.).
The author's results agree with those of previous workers except in the case of the white-seeded variety Pearl. In every cross involving this variety the $F_1$ seed coats are red. In

crosses with another white-seeded variety, Philippine White, which appears from other crosses to have no genes for colour, the $F_1$ has red and the $F_2$ has red, flesh-coloured and white seed coats. The results from all crosses indicate that the variety Pearl has genes for both red and flesh seed-coat colours and also two inhibitors, both of which are necessary to prevent the development of colour.

## SMALL BUSH FRUITS 634.7

544. KUZMIN, A. Y. 634.72:575.127.2
**(Results of inter-subgeneric hybridization in the genus *Ribes*).**
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : Nos. 5–6 : 41–50.

The first flowers of the hybrid *R. nigrum* L. x *R. dikuscha* Fisch. when pollinated with the gooseberry produced 98 hybrid plants, all of which were intermediate in leaf form and bore short spines. Nine of them were immune to *Sphaerotheca*, 28 resistant and 61 susceptible. Forms with woody and herbaceous bud scales and various intermediates occurred. All plants were attacked by mildew. The number of flowers per inflorescence varied in different hybrids from one to five. The fruits were either equal, slightly superior or slightly inferior to the black currant in size, the seeds resembling gooseberry seeds. One of the hybrids stood out on account of its fruits, which were reminiscent of a gooseberry.
The hybrid Kazyrgan (*R. rubra* x *R. petraea*) was successfully crossed with both black currant and gooseberry and also with *R. odoratum* Wendl. and with the *R. nigrum* x *R. dikuscha* hybrid and is regarded as a useful bridging species. In hybrids between the sections Ribesia and Coreosma the characters of the black currant are mainly dominant, with the exception of the characteristic aroma of the leaves and stem. The practical advantages to be obtained from a combination of these two sections are enumerated.

545. EVREINOFF, V. 634.72:576.16
Origines et ancêtres des groseilliers à grappes cultivés. **(Origin and ancestors of the cultivated *Ribes*).**
Bull. Soc. Nat. Hort. Fr. 1939 : **6** : Sér. 6 : 135–42.

The author discusses the origin, systematics and distribution of the genus, giving detailed descriptions of three species regarded as possible ancestors of the cultivated forms, namely *R. vulgare*, *R. rubrum* and *R. petraeum*; the opinion is expressed that the majority have arisen from *R. vulgare*. A new scheme of classification of the cultivated varieties is presented, based on the structure of the flower, leaf, fruit and fruit cluster. It is claimed that the system is simpler than existing ones and that each group, of which there are five, corresponds to a definite species or species hybrid from which its varieties have been derived.

546. MCUMBER, R. R. 634.75–2.8–1.521.6:575.42
**Yellows resistant Blakemore strawberries.**
Proc. 34th Annu. Convent. Tenn. Hort. Soc. 1938 : 97–99.

A report of a yellows-resistant strain obtained from the variety Blakemore.

## OTHER FRUITS 634.77

547. BAKER, K. F. and COLLINS, J. L. 634.774:581.9:576.16
**Notes on the distribution and ecology of *Ananas* and *Pseudananas* in South America.**
Amer. J. Bot. 1939 : **26** : 697–702.

Evidence is presented that *Pseudananas* and most of the species of *Ananas* are native to the part of South America east of 59° W. longitude and between the latitudes of 14° and 29° S.

548. 634.835:575
634.835:575.116

Husfeld, B.

Genetik und Rebenzüchtung. (**Genetics and vine breeding**).

Agron. Lusitana 1939 : **1** : 200–35.

In this report (which has been referred to in "Plant Breeding Abstracts", Vol. IX, Absts. 472 and 1209) an instance of linkage (hitherto unknown in the vine) is recorded, namely a correlation between *Plasmopara* susceptibility and American habit and European flavour found in a Riparia x Gamay 595 cross.

Also, the occurrence in interspecific crosses of European Vinifera varieties with American species, of correlations between resistance to *Plasmopara viticola*, flavour and colour of the juice of the grapes is mentioned, with certain reservations as regards the interpretation of such correlations, which are not absolute.

549. 634.835:575
634.835–2–1.521.6(43)

Ségal, L.

Sélection de vignes résistantes aux parasites en Allemagne. (**Breeding vines resistant to parasites in Germany**).

Rev. Vitic., Paris 1939 : **90** : 473–75.

A review of the work by Scherz of Müncheberg (cf. "Plant Breeding Abstracts, Vol. IX, Abst. 1618).

550. 634.835:576.356.5

Olmo, H. P.

La caryologie des *Vitis* et ses applications à la création de nouvelles variétés. (**The karyology of *Vitis* and its application to the creation of new varieties**).

Rev. Hort., Paris 1939 : **26** : 557–58.

Reference is made to a number of forms that have been identified as tetraploid ($4n = 76$). They have occurred in quite a range of varieties and when crossed with the diploids have given rise to triploids that are more vigorous than either of the two parents. They are useful as rootstocks and attempts are now being made to combine triploidy and parthenocarpy in order to produce forms with large seedless grapes.

551. 634.835:581.45:578.088.9

Rodrigues, A.

Sôbre a caracterização das espécies e híbridos do género *Vitis*. Um novo método ampelométrico. (**Describing the characteristics of species and hybrids of the genus *Vitis*. A new ampelometric method**).

Agron. Lusitana 1939 : **1** : 315–26.

The leaf is divided into two parts by the central vein; taking this vein as the base, it is possible to make three triangles, namely that formed by the angle of the central vein with the extremities of the main lateral veins and with the extremity of the first ramification of the secondary vein nearest the base of the second lateral. A very close resemblance was found in the form of these triangles in different leaves from the same variety. By taking the length of the main vein as constant and drawing the triangle corresponding to the various angles concerned it was found that the vertices of the triangles for all leaves of a single variety formed a compact group, distinct from similar groups formed by other varieties. The central point of each group of dots made by the vertices is taken as characteristic for the variety. The radius of the circle described by the dots also differs in different varieties.

The same procedure is applied to each of the three triangles; the third, describing the leaf sinus, often gives more marked differences than the other two.

Certain interspecific hybrids examined also displayed characteristic distribution of the dots, which in some cases showed a clear resemblance to the distribution for one of the two parental species.

552. PIROVANO, A. 634.835:581.48:575.12
Nuove uve da tavola redditizie senza semi. **(Profitable new seedless dessert grapes).**
L'Ortofruttic. Italiana 1939 : **8** : 173–76.

The sultana grape requires an arid climate and does not thrive in the normal vine growing districts. In a cross between Muscat d'Alexandrie and Sultanina bianca 4·54 per cent of the hybrids were practically seedless, 10·81 per cent semi-seedless and the remaining 83·65 per cent were possessed of normal seeds. The size of fruit and of seed were generally correlated. Two promising seedlings classed as practically seedless, unusually early in maturity and regular in yield have been obtained. One of them, No. 165, matures at the same time as Chasselas Blanc, which is sufficient to permit of the fruits being dried even in temperate climates; it is suited mainly to dry localities, yields well and produces bunches and fruits of medium size, the fruit being sweet with a delicate muscat flavour. It has been named Maria Pirovano.

No. 166 is very vigorous and somewhat hardier and more adaptable than 165; the grapes are small and sweet, of the Chasselas type and are produced abundantly.

Among the semi-seedless No. 130, named Pardina, from the cross Sultanina x Sciamblese, is valued on account of its exceptional productivity, very large bunches and large grapes of sultana flavour. The majority of fruits are seedless but the largest contain one or two perfect seeds. It is a mid-season variety and regarded as one of the best so far produced; though susceptible to *Peronospora* it is less so than Regina.

553. 634.835–2.7–1.521.6
PIROVANO, A. 634.835–2.411.4
Mitteilungen über europäische Reben, die sich als resistent gegenüber Phylloxera und teilweise resistent gegenüber *Peronospora* erwiesen haben. **(Reports of European vines which have proved resistant to phylloxera and partially resistant to *Peronospora*).**
Wein u. Rebe 1939 : **21** : 144–53.

One seedling of the cross Grecco bianco x Ischia precoce was recognized some years ago as being resistant to phylloxera. The hybrid, which is a true *Vitis vinifera*, is described. It has also proved more resistant to *Peronospora* than most other varieties, a quality shared by certain other hybrids of Grecco bianco.

Sciamblese is another variety resistant to *Peronospora* and resistant seedlings have been obtained in crosses of its seedling No. 50 (Bicane x Sciamblese) with Delizia di Vaprio (Foster bianco x Muscat d'Alexandrie); one of these with good quality and yield has been named Marengo. Other seedlings from Sciamblese crossed by other varieties have proved resistant and occasional resistant forms have appeared in crosses between common susceptible varieties.

## FORESTRY 634.97

554. SCHREINER, E. J. 634.97:575(74.6)
**Research in forest genetics at the Northeastern Forest Experiment Station.**
Rep. Proc. 29th Annu. Mtg Nth. Nut Gr. Ass., Mass. 1938 : 12–14 September : 53–58.

The chief activities of the Station are : the selection and vegetative propagation of exceptional wild trees, including sugar maples with high sugar yield, good timber trees and white pines resistant to blister rust; breeding work, which is necessarily to be preceded by studies of flowering habits and breeding technique (early emphasis is to be placed on interspecific hybrids on account of their vigour); investigational work on vegetative propagation and the induction of polyploidy by the use of colchicine. The tree breeding technique in use at the Station is described (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 487).

555. HOUTZAGERS, G. (Editor) 634.972.3:582
Eerste beschrijvende rassenlijst voor populieren 1938. (**First descriptive list for races of poplars 1938**).
Published by the Nederlandsch Algemeen Keuringsdienst (N.A.K.) Pp. 20.
A compact and useful booklet of authenticated descriptions of 31 species and varieties of poplars, including hybrids and other forms. The material is conveniently classed as (*a*) generally recommended varieties, (*b*) forms recommended for special uses, (*c*) new varieties whose value for Dutch conditions has still to be decided and (*d*) species of no practical value for Holland.
The introduction contains a botanical description of the genus *Populus* L., its floral biology and descriptions of the five sections composing the group.
The area under poplar cultivation in Holland is shown.
An alphabetical index completes the pamphlet.
Incidentally British workers consulting Dutch literature on the subject will be grateful for the information on the equivalents given under *P. nigra* var. *italica* on p. 15.

556. 634.972.4–2.421.9–1.521.6:575.127.2(73)
GRAVES, A. H. 634.53:575(73)
**The development of blight resistance in hybrid chestnuts.**
Rep. Proc. 29th Annu. Mtg Nth. Nut Gr. Ass., Mass. 1938 : 12–14 September : 31–36.
A further account of the chestnut breeding work being conducted under the auspices of the Brooklyn Botanic Garden (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 850). The chief aim of the breeding work is still to combine resistance to blight (*Endothia parasitica*) with the useful timber characteristics of the susceptible American chestnut, but since it is found to be possible to cross almost any combination of chestnut species, attention is also being paid to resistance to cold and insect attack, quality and quantity of fruit, precocity and prolificness. Some fifty kinds of chestnut hybrids have so far been produced and are listed. These are inoculated annually with the fungus and are also exposed to natural infection.
Two *C. crenata* x *C. dentata* hybrids have so far shown absolute resistance. The main species may be placed in the following descending order of resistance: *C. mollissima, C. crenata, C. sativa, C. dentata.*
The best hybrid so far obtained is a *C. crenata* x *C. dentata* tree which is 24 feet high after seven years of growth; it is not, however, completely disease resistant. It is being crossed to various immune hybrids.
The future programme is to continue breeding Japanese-American and Chinese-American hybrids to other desirable stocks and to interbreed $F_2$ Japanese-American hybrids. Certain other combinations also appear promising.
In addition to this breeding work, efforts are being made to obtain resistant types of *C. dentata* by growing nuts from trees that have survived the blight.

557. WETTSTEIN, W. VON and
PROPACH, H. 634.972.6:575.127.2:581.162.32
Sichtungsarbeit zur Birkenzüchtung. (**Reconnaissance work in birch breeding**).
Züchter 1939 : **11** : 279–80.
The chromosome number has been found to be a useful guide in the systematic determination of a specimen, *Betula verrucosa* for instance having $2n = 28$, *B. pubescens* $2n = 56$. Some trees classed as *B. pubescens* on account of their high quality for veneer production, have proved on cytological examination to belong to *B. verrucosa*, a species previously regarded as inferior for this purpose.
Natural hybrids between the two species have been found among seeds from both. One seedling of *B. verrucosa* had $2n = 46$–$52$ and it is thought to have arisen by pollination by a triploid hybrid.
A study of the economic value of the hybrids is to be made.

558. Goidànich, G. and
Azzaroli, F. 634.972.8–2.421.9–1.521.6
Relazione sulle esperienze di selezione di olmi resistenti alla grafiosi e di inoculazioni artificiali di "*Graphium ulmi*" eseguite nel 1938. (**Report on experiments on selecting elms resistant to elm disease and on artificial inoculations with *G. ulmi* in 1938**).
Boll. Staz. Pat. Veg. Roma 1939 : **19** : 222–40.
Artificial inoculations have shown *Ulmus pumila* to be resistant, in *U. campestris* only certain strains were resistant, while *U. laevis* appeared to be entirely susceptible. All the 35 hybrids of *U. pumila* tested (some with *U. campestris*, some with *U. montana*) remained free from attack and some at least are expected to prove resistant. Plants of the elm "Cr. Buisman" were quite free and the variety is thought to be one of distinct promise.

559. Blin, H. 634.973:575.127.2
L'hybridation dans le genre Eucalyptus. (**Hybridization in the genus *Eucalyptus***).
Rev. Hort., Paris 1939 : **26** : 555–56.
Numerous cases of the occurrence of natural hybrids between different species are cited from the literature.

560. Riker, A. J. and
Kouba, T. F. 634.975–2.452–1.521.6:575(77.5)
**White pine selected in blister-rust areas.**
Phytopathology 1940 : **30** : p. 20. (Abst.).
A small proportion of white pine trees (1 in 300 or 500) in unprotected areas in Wisconsin have survived exposure to natural infection with *Cronartium ribicola* for 15–20 years without showing signs of cankers. A selection of 163 such putatively resistant trees was made and seed from each has been sown in the nursery; grafts with scions of 40 parent trees were also made. These seedlings and parents are to be tested for resistance to the fungus.

## VEGETABLES 635

561. 635:575(43)
Reinhold, J. 633.4:575(43)
Zuchtziele im Gemüsebau. (**Aims in breeding in vegetable culture**).
Forschungsdienst 1939 : **8** : 287–98.
The author proposes to deal with the more specialized aims to which the attention of the scientific and practical breeders of vegetables in Germany might well be directed, rather than the obviously important and accepted aims such as high and reliable yields, uniformity of type, earliness and keeping quality (in certain varieties), resistance to damage of various kinds, nutritive content, etc. Cabbage, lettuce, spinach, rhubarb, onions, leeks, parsnips, parsley, cucumbers, melons, tomatoes and vegetable marrow are among the numerous crops which are mainly briefly treated. A bibliography of German sources most of which have been already abstracted in "Plant Breeding Abstracts" is added.

562. 635:575(74.6)
Norwood, J. W. 635.67:575(74.6)
**Back stage work toward better vegetables.**
Market Gr. J. 1939 : **65** : 439–41.
A popular account of some of the vegetable breeding work being conducted in Connecticut, and particularly of the sweet corn breeding being done by E. B. Clark at Milford, Conn.

563. Jones, H. A. 635–2–1.521.6:575
**Progress in the development of vegetable varieties resistant to disease.**
Chronica Botanica 1939 : **5** : 381–83.
A summary of recent papers on the subject; these have been summarized individually in "Plant Breeding Abstracts".

564. KRICKL, M. 635.25:581.6:575(43)
Neue Zuchtziele bei Küchenzwiebel im Hinblick auf die Marktversorgung. (**New breeding aims in the cooking onion with a view to supplying the market**).
Züchter 1939 : **11** : 321–24.
Varieties that do not begin to sprout till early or late April and which lose the minimum amount of weight during storage are required to extend the duration of the season. An examination of a number of onions belonging to élite stocks showed them to sprout at varying times from 15th November to 18th April. Those bulbs which sprouted latest also lost the least weight during storage and had a higher osmotic pressure. It is clear therefore that by continued selection a considerable improvement in keeping quality could be attained.

565. OSAKA, S. 635.31:576.312.35
(**The number of chromosomes in some *Asparagus* species**).
Commemoration Papers on Agronomy Prepared in Honour of Professor Masao Akemine on the Occasion of the Thirtieth Anniversary of His Academic Service by his Friends and Pupils, April, 1938 : 187–90.
The chromosome numbers of nine species of *Asparagus* are reported; that of *A. officinalis* is given as $2n = 20$.

566. DREWES, H. 635.34:575:578.08(77.4)
**Cabbage breeding.**
Market Gr. J. 1939 : **65** : 486–88.
An account of the technique of cabbage breeding and seed production, with particular reference to the work of the Ferry-Morse Seed Company in Michigan. Selections made in the field are stored for two months at about 34° F. and replanted in the greenhouse, where they are selfed. The progenies of these plants are selected again in the field and the best plants selfed a second time, a treatment which leads to increased uniformity without noticeable loss in vigour. Further selection and field trials follow. Non-bolting strains such as Ferry's Round Dutch, yellows-resistant types, an improved savoy variety, Chieftain and a large selection of Hollander are among the notable recent productions of the Company.

567. HOWARD, H. W. 635.347:576.356.5:576.354.4:576.312.38
**The cytology of autotetraploid kale, *Brassica oleracea*.**
Cytologia, Tokyo 1939 : **10** : 77–87.
Autotetraploid kale ($4x = 36$) formed from two to five quadrivalents at meiosis, with a mean of four. Numerically irregular disjunction was frequent and only 57 per cent of second metaphase plates had 18 chromosomes. Seed fertility was about 35 per cent that of the diploid.
Secondary associations of chromosomes were examined in the diploid and the tetraploid. In the diploid, associations of three chromosomes were much more frequent than in the material studied by Catcheside (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 521). In the tetraploid there were various associations of four, three and two chromosomes, as is to be expected from the fact that the probable chromosome constitution of this form is AAAA BBBB CCCC DD EE FF.

568. 635.41:576.312.34
HÅRDH, H. 635.41:576.356.5
Tutkimuksia kromosomimorfologiasta ja polysomatia-ilmiöstä *Spinacia oleracea*lla L. (**Studies of the chromosome morphology and polysomaty in *Spinacia oleracea* L.**).
Maataloust. Aikakausk. 1939 : **11** : 317–32.
Studies of the chromosome morphology of nine varieties of spinach were made. It was found that the varieties Nobel, Viroflay, Juliana, Victoria, de Gaudry and Weseler have one pair of satellited chromosomes, while the varieties Erste Ernte, Kongen av Danmark and Heterosis

have two such pairs. The variety Heterosis differs from the others in that one of the pairs of satellited chromosomes has its centromere in a more nearly median position than the other varieties.
The author concludes that polysomaty in *Spinacia* results from the occurrence of two successive chromosome divisions in a single prophase, and is not dependent on nuclear fusion (cf. "Plant Breeding Abstracts", Vol. X, Abst. 242).

569. Kopetz, L. M. 635.52:581.44:578.088.9
Strunkuntersuchungen an Kopfsalaten. **(Stalk investigations in cabbage lettuces).**
Züchter 1939 : **11** : 277–78.
Tracings were made of the outline of the stalk in cross-sections of the lettuce head. Data presented show that varieties differ in the form of the stalk cross-section and in the variation occurring within the variety, some being much more uniform than others.

570. 635.52–2.8–1.521.6:575(79.4)
Jagger, I. C. 635.52:575.11
**Brown blight of lettuce.**
Phytopathology 1940 : **30** : 53–64.
Brown blight of lettuce, due to an unknown soil-borne pathogen, is commercially important in the Imperial Valley of California and in parts of Arizona. The varieties Big Boston and Chavigne, themselves commercially valueless in the affected regions, proved highly resistant or immune to the disease and also resistant to the so far unimportant disease "big vein". Crosses were made between Chavigne and the most important local variety New York, and in the $F_2$ a 3 : 1 ratio of healthy to diseased plants was obtained, indicating that resistance was due to a single dominant gene. It seemed possible to select desirable resistant types from this progeny, but progress in that direction was overshadowed by the development of resistant strains of the New York variety from occasional resistant plants found in a badly infected field. From these plants three strains were finally tested and one, Imperial No. 2, is now available to growers. This is of desirable New York type and highly resistant to brown blight, though it is not resistant to "big vein".

571. Sinnott, E. W. and
Whaley, W. G. 635.61/3:575–181:519.241.1:581.47:581.44
**The developmental basis of inherited size differences in plant organs.**
Genetics 1940 : **25** : p. 136. (Abst.).
Measurements show that in *Cucurbita* and *Lagenaria* large-fruited forms have larger vegetative organs than small-fruited forms. These differences in the size of organs are all correlated with the volume of the apical meristem of the stem. In the $F_2$ of crosses between large-fruited and small-fruited forms the same correlation between the size of the vegetative organs and fruit size is evident, indicating that these characters have a common genetic basis which operates by controlling the size of the apical meristem.

572. Goldhausen, M. 635.615–2.112–1.521.6:575.127.2
**[Breeding drought-resistant (desert) water-melons].**
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 13 : 18–21.
Crosses between the wild, highly drought-resistant species *Citrullus colocynthis* (L) Schad. and *C. edulis* Pang. succeeded distinctly better when the former species was used as maternal parent. In the reciprocal cross however the seeds were much larger and their germinating capacity much higher. The quality of the seeds produced varied with the variety of cultivated water-melon used. The $F_1$ plants were almost entirely of the wild type; their fruit size and time of maturity varied according to the water-melon parent used.
Though segregation occurred in the $F_2$, the wild characters again predominated; even in the $F_3$ and $F_4$ no forms with flesh suitable for dessert purposes were produced in families consisting of 300 to 350 plants. Certain plants appeared distinctly promising however for forage purposes

and though mostly somewhat late in maturity proved excessively drought-resistant, and capable of growing in the desert without irrigation.
By back-crossing with *C. edulis* a great improvement was obtained in fruit form, flesh consistency and sugar content; of these the majority died from drought in the early growth phases but 26 per cent survived; most of these were late in maturity but by selection from large populations it is hoped to produce suitable forms.

573. Powers, L. 635.624:575.42"793"(78.7)
**Early Cheyenne Pie pumpkin.**
Circ. U.S. Dep. Agric. 1939 : No. 537 : Pp. 4.
The new variety is a single plant selection from the New England Pie pumpkin that was developed at Cheyenne, Wyoming. It has been inbred for six generations. At Cheyenne it matures one to two weeks earlier than the earliest commercial strain of New England Pie and bears a large number of small fruits of desirable type. It appears to be resistant to some of the diseases of pumpkins prevalent under irrigated conditions. It is recommended for growing at the higher elevations in the northern United States.

574. Doolittle, S. P.,
Beecher, F. S. and
Porte, W. S. 635.63–2.3–1.521.6:575(73)
**A hybrid cucumber resistant to bacterial wilt.**
Phytopathology 1939 : **29** : 996–98.
Selections from the cucumber cross Tokio Long Green x Vickery Forcing which show considerable resistance to bacterial wilt (*Bacillus tracheiphilus* EFS.) have been obtained at Beltsville, Maryland. The crop loss due to wilt in these lines is slight, but no entirely satisfactory horticultural type has yet been obtained, and they are only fairly prolific. Certain other hybrids of more marked mosaic tolerance have shown some wilt resistance and further work is in progress, particularly with reference to pickling varieties.

575. Ekstrand, H. 635.64:581.143.32:575
Ärftliga missbildningar av tomatfrukter. (**Heritable malformations of tomato fruits**).
Växtskyddsnotiser 1939 : Nos 4–5 : 55–57.
Two types of inherited abnormalities in tomatoes are described.
The first, which became evident at an early stage, consisted in fasciation of stem and branches, irregularities in the number of flower parts, fusion of the sepals and other flower parts. Furthermore, the abnormal flowers produced abnormal fruits, crinkled and segmented, with, in some instances, fissures in the pericarp through which the placenta was visible. The set of seed in such fruits was very poor.
In the second type of abnormality the plicate portions of the pericarp do not (as in the first case) form a circle but are irregularly situated within and on top of the normal pericarp structure like a group of small tomatoes on top of a larger main fruit. The plants in this case were otherwise normal.
Growers should not use plants showing such defects for seed raising.

576. Rybin, V. A. 635.651:576.356.5:581.04
**Tetraploid plants of *Vicia Faba* produced by colchicine treatment.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 483–85.
Two tetraploid plants of *V. Faba* were produced by immersing the shoots of seedlings in colchicine. They differed from the diploids mainly in their slower growth and in having thicker leaves with blunter and broader leaflets.

577. DANIEL, L. 635.652:575.061.6:575.322:581.47
Sur les variations de la couleur des gousses et des graines des haricots.
**(On the colour variations of the pods and seeds of beans).**
C.R. Acad. Sci., Paris 1939 : **209** : 499–501.
Some of the numerous variations observed by the author after an excessively wet season are regarded as material for the study of the origin of races of beans (*Phaseolus*) and the inheritance of acquired characters.

578. ENKEN, V. B. 635.652–2.3–1.521.6
**(Infection of beans with bacterial diseases).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : 17–20.
Three varieties are classed as resistant, White Haricot, Coco Blanc and Yellow Eye. Crossing work to increase the resistance of existing forms is being attempted and several forms thought to be promising as parents are indicated.

579. DELWICHE, E. T. 635.655:575(77.5)
**Extending the soybean belt northward.**
Proc. Amer. Soybean Ass., 19th Annu. Mtg, Madison, Wisc. 1939 : Sept. 11–12 : 22–26.
The efforts made to obtain varieties of soya bean suited to the conditions of northern Wisconsin are reviewed. Introduction, variety testing and pure line selection have been carried out continuously since 1901. Three strains have so far been released to farmers from the Spooner Experiment Station; Wisconsin Early Black (No. 1), Mandarin (S–19.507) and Manchu (S–20.606). The sensitivity of the soya bean crop to the influences of length of day, drought and heat, with the consequent necessity of searching for strains with strictly local adaptation, is stressed.

580. SLUGIN, P. T. 635.655:581.192:575(47)
**(The chemical composition of the new varieties of soya bean of the Ussuri Breeding Station).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : 20–21.
The characteristics of a number of varieties are given in respect of oil content, earliness, yield and position of the lowest pod, as high a position as possible being desired for mechanical harvesting. The oil content varied from 18·94 to 21·00 per cent in different varieties, the nitrogen content from 5·94 to 6·86 per cent, the nitrogen tending to be in inverse proportion to the oil. Variations were observed in the content of cellulose and salts but these were not correlated with the fat and nitrogen.
The best of the newly produced varieties are indicated.

581. GENERALOV, G. F. 635.656:575(47)
**(New high yielding varieties of peas).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : 12–14.
The variety Štambovyi P2, a mass selection from a local strain, has excelled others in yield; Urožainyi P-1, of similar origin, has also given high yields. Early Victoria 013, produced by individual plant selection, has exceeded the standards in earliness and in yield. Uladovskii 0208 is a form with round green seeds, obtained by individual plant selection from the variety Folger-Heine, which it has outyielded by up to 50 per cent.
Certain other varieties which appear promising are also mentioned.

582. Košel'kova, N. N. 635.658:575(47)
**(New varieties of lentils).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 9 : 14–15.

New individual plant selections are referred to that have excelled the standards in yield, seed size and protein content.

583. Henderson, P. 635.67:575(73)
**Some new hybrid sweet corn. How Cream O'Gold and Sunny-Gold were bred.**
Market Gr. J. 1940 : **66** : p. 29, 31–32.

Cream O'Gold was developed from the cross Money Maker x Golden Bantam, the aim being to combine the long, tightly wrapped husks, long slender ears and fine quality grain of Money Maker with the smaller plant size, earlier maturity and larger, deeper yellow grain of Golden Bantam.

Sunny-Gold is a hybrid sweet corn produced by crossing open-pollinated Cream O'Gold and Purdue 51.

# BOOK REVIEWS

NEEDHAM, J. and
PAGEL, W. (Editors). 5
**Background to modern science. Ten lectures at Cambridge arranged by the History of Science Committee 1936.**
University Press, Cambridge 1938 : 7s. 6d. Pp. xii + 243.

In 1936 a series of lectures was started in Cambridge, organized by a committee known as the History of Science Committee and in the book under review we have in published form the first ten of these lectures, the titles and lecturers being as follows:—Greek Natural Philosophy and Modern Science by F. M. Cornford; From Aristotle to Galileo by Sir W. C. Dampier; Forty Years of Physics by the late Lord Rutherford; Forty Years of Crystal Physics by W. L. Bragg; Forty Years of Atomic Theory by F. W. Aston; Forty Years of Astronomy by Sir A. Eddington; Forty Years of Physiology and Pathology by J. A. Ryle; Forty Years of Parasitology and Tropical Medicine by the late G. H. F. Nuttall; Forty Years of Evolution Theory by R. C. Punnett; and Forty Years of Genetics by J. B. S. Haldane.

Apart from the first two, the lectures are all concerned with the period 1895 to 1935 and were given by leading authorities in the subjects concerned. It will be noticed that all the lecturers were closely connected with Cambridge University and indeed the usual formula for introducing the lecturers at each of this series was "Professor So-and-so needs no introduction to Cambridge audiences". The large attendances at the lectures indicated a very healthy interest in the history of science and suggest that the book will have a wide sale. In general it may be said that a very high standard is maintained throughout and the lectures are both instructive and stimulating.

Though every lecture is of great interest to all scientific workers, plant breeders will doubtless find the last two of special interest. Both are masterly summaries and neither is as restricted as its title indicates. Professor Punnett goes back to pre-Darwinian times and Professor Haldane to de Vilmorin's progeny test and Mendel's work. In both these lectures we find hints of the connexion between the more academic theory and the practical activities of plant and animal breeding and one might perhaps wish that this aspect had been considered in greater detail.

It should be mentioned that the book is one of a series called "The Cambridge Library of Modern Science" and the production is of the usual high standard of the Cambridge University Press. J. L. F.

WISHART, J. 519.24:631.421:575
**Field trials: their lay-out and statistical analysis.**
Imperial Bureau of Plant Breeding and Genetics, Cambridge 1940 : 2s. 6d.
Pp. 36. 5 figs. 26 tables.

The plant breeder is inevitably faced with the problem of the statistical estimation of yield differences, and usually he is not a mathematician and is bewildered rather than helped by the average textbook of mathematical statistics. This publication is intended as an introduction to field trial technique for such non-mathematically inclined breeders. In it the most important layouts required for variety testing and similar purposes are clearly described and worked examples given, all without recourse to any complex mathematical theorizing.

Starting with an account of the reasons why statistical treatment is necessary, the author goes on to show how a standard error is computed and how it can be used to determine the significance of differences between means. Then the randomized block, the Latin square and the multiple factor layouts are dealt with in turn, together with the split plot experiment, a special case of the factorial type. Finally quasi-factorial or incomplete block layouts are referred to and two simple examples, suitable for comparing 16 and 21 varieties respectively without undue replication, are described and illustrated by reference to an experiment carried out with 21 barley varieties. For more complicated layouts of this type the reader is referred to "The Design and Analysis of Factorial Experiments" by F. Yates (Imperial Bureau of Soil Science, Harpenden 1937, Technical Communication No. 35).

Throughout the treatment will be found to be lucid and free from complications. There is no attempt to deal with all the statistical devices likely to be of use to the plant breeder (such as the analysis of covariance or the calculation of values for missing plots) but the reader is referred to other recent texts in which such methods are described.

BURBANK, L. 575:633:007(79.4)
**An architect of nature.**
Watts and Co., London 1939 : 1s. 0d. Pp. xvii + 139. (The Thinker's Library, No. 76).

BURBANK, L.
**Partner of nature.**
D. Appleton-Century Company, Incorporated, New York and London 1939 : 15s. 0d. Pp. xi + 315. illus.

The first of these books is an autobiography of Luther Burbank, in which we are acquainted with the major achievements of his long career of plant breeding and with a good deal of his philosophy. The second and larger work contains much material in common with the first, but it is written more expressly with the aim of attracting newcomers to the field of plant breeding; consequently we are given a good deal of instruction in biological principles and the particular achievements of Burbank are described chiefly to illustrate the enormous possibilities open to the plant improver, even to the enthusiastic amateur. Among the more general subjects discussed in this second volume are the ways in which plants ensure their own cross-pollination and the ways in which they protect themselves, and more practical topics such as methods of grafting and seed raising.

Burbank's theories of evolution and similar topics are typical of many of the immediate followers of Darwin. Much emphasis is placed on the theory of use and disuse, for instance the violet developed cleistogamous flowers because it grew so close to the ground that it could not rely on being found by insect pollinators; when cultivated by man such a manoeuvre was no longer necessary and the plant gave it up forthwith. The actual phraseology is much more extravagant than this, e.g. "Into the life of one of the violets a few hundred years ago man came and the flower found itself encouraged to thrive. Soon this particular violet, as if assured of reproduction, abandoned all its strenuous efforts and devoted itself, in gratitude and confidence, to making bigger and more beautiful and more variegated blossoms for the creature who had been so kind to it. . . ."

Some of the theories advanced are even more surprising than this. For instance, Burbank once imported twelve plum seedlings from Japan, which grew extraordinarily well in California. The reasons given were (1) "that the enforced rest given the plants, as a result of being uprooted, carefully packed, and moved half-way around the globe, had enabled them to store up unusual strength" and (2) "that the change of climate had so benefited the seedlings that they improved as a child might that had been sent to California for its health". Apparently this rare good fortune of the parents led also to similarly improved progeny.

As a record of individual pioneering achievement these volumes will be of much interest, and the more philosophical parts are certainly not dull. Burbank was a nurseryman with a great and sustained enthusiasm for plant improvement. He had a remarkable facility for selecting the right plant out of many thousands; he was original in outlook (for instance he dreamt of a huge stock-raising industry in the south-western deserts of the United States based on a spineless cactus which he set out to breed and successfully produced) and he always worked with very large numbers of plants.

58
575
HAUPT, A. W. 576.12
**An introduction to botany.**
McGraw-Hill Publishing Company, Ltd., London 1938 : 19s. 9d. Pp. xii + 396. 278 figs.

This new text-book of botany for first year students follows fairly familiar lines. An introductory chapter is followed by chapters on vegetative organs, cells and vegetative tissues.

Physiological chapters on water relations and metabolism and irritability lead on to an ecological chapter. The flower and fruit, floral evolution and pollination, and seeds and seedlings are next dealt with and there is a very uninspired, not to say inaccurate, chapter on heredity and plant breeding.
For example we read that with "corn [maize] and certain other cross-pollinated plants . . . the pedigree method is not applicable". The next six chapters cover special botany and the book ends with a chapter on palaeobotany and two on evolution; in the first of these the evidence for evolution is presented and in the second Lamarckism is compared with Darwinism and De Vries' mutation theory is mentioned.
On page 59 the chromosome number of cotton is given as 56, possibly a compromise between 52 and 26! The illustrations throughout the book are plentiful and very good. There is an index but no bibliography. J. L. F.

HEIM, R. 581.16
La réproduction chez les plantes. (**Reproduction in plants**).
Armand Colin, Paris 1939 : Collection No. 220. 15 fr. Pp. 224 + 16. 32 figs.

In this little book an outline is given of the modes of reproduction, and hence the life histories of each of the major groups of plants, including the bacteria and Myxomycetes. In the case of some of the groups (e.g. fungi and algae) the various orders are considered one by one. The whole forms a useful summary which may be of value to the research worker for reference or revision purposes, but the work is neither detailed enough nor well enough illustrated to be really useful as a textbook.

KOMAROV, V. L. and
BUSCH, N. A. (Editors) 581.9(47)
(**Flora of the U.S.S.R. Volumes VIII, IX**).
Edited by the Scientific Academy of the U.S.S.R. Leningrad 1939. Vol. VIII: Unbound 17 roubles 50 copecks, Bound 20 roubles. Pp. xxx + 692. 34 figs; Vol. IX: 17 roubles. Pp. xix + 539. 30 figs.

The families dealt with in these two volumes which continue the series already reviewed (cf. "Plant Breeding Abstracts", Vol. VII, p. 443) include the Capparidaceae, Cruciferae and Resedaceae in Vol. VIII and the Crassulaceae, Saxifragaceae, Hamamelidaceae, Eucommiaceae, Platanaceae and Rosaceae in Vol. IX.
As before adequate indexes are provided and also lists of Russian geographical and other abbreviations.

632.111
**Bibliography on cold resistance in plants.**
Imperial Bureau of Plant Breeding and Genetics, Cambridge 1939 : 1s. 6d. Pp. 22.

This bibliography has been compiled with the object of assisting workers who are investigating the problems pertaining to cold resistance in plants and its inheritance. It contains, in addition to references to papers on breeding for resistance and the strictly genetical aspect, which have been abstracted in "Plant Breeding Abstracts", others of a more general nature bearing on the physiological nature of resistance and on problems of technique.
The references have been decimally classified under subjects as in "Plant Breeding Abstracts", with adequate cross references in italics at the end of each subject group where any subject groups may overlap owing to the scope of certain papers.
The source in the titles is followed (in square brackets) by the relevant Volume and Abstract number in "Plant Breeding Abstracts", when an abstract has been published by the Bureau.
It is hoped that the bibliography will meet the needs of a large number of research workers and further enquiries arising out of its use will be welcomed.

HARVEY, R. B. 632.111:016

**An annotated bibliography of the low temperature relations of plants.**

Burgess Publishing Company, Minneapolis, Minn. 1936 : Rev. ed. $4.00. Pp. ii + 240. (Mimeographed).

This bibliography consists of two parts the first representing the first edition, and the second, an appendix published in 1936 and containing references "found since the first edition of 1935". Part I contains 3412 references (195 pages of references in double columns) and Part II 16 pages of references, unnumbered.

The classification is alphabetical according to the names of the authors, but a subject index is provided for Part I.

According to the introduction the bibliography has taken 15 years to compile and "during the past five years, principal time has been given to checking the citations by obtaining the original article, translating it if necessary, and correcting the form of the citation. . . . The titles of articles in languages other than English have been translated because not many students read more than three languages *(sic)*. If the title of the article is not indicative of the contents of the article, annotations have been used to indicate briefly the contents". Unfortunately in spite of the years devoted to the all important aim of ensuring accuracy in the titles, translations, etc., and uniformity in the mode of citation, it has been a regrettably simple matter for the reviewer to find by a relatively short examination numerous examples of wrong spelling of foreign words (including the omission of accents on French words and "Umlauts" on German ones) and wrong or inaccurate translations. Moreover, the mode of presentation is inconsistent and would present difficulties for any reader who is not a linguist and who wishes to quote from the bibliography.

The reviewer has been unable to divine the system upon which the decisions regarding the translation of titles have been based; in some instances (German, Italian, Swedish references) no translation is given, though most titles in these languages are translated. The note on the subject in the introduction is obscure.

In spite of these very regrettable defects the whole work must obviously contain an enormous amount of bibliographical material of value to the research worker who wishes to consult first hand existing literature on the manifold aspects of the low temperature relations of plants.

SWANSON, C. O. 633.11:664.641.016

**Wheat and flour quality.**

Burgess Publishing Company, Minneapolis, Minn. 1938 : Rev. ed. $3.00. Pp. 227. 12 figs. 134 tables. (Mimeographed).

This is a reprint of the book reviewed in "Plant Breeding Abstracts", Vol. VIII, p. 422, with a very slight amount of revision.

(1) FALLON, F. 633.825

Le gingembre. (**Ginger**).

Propagande et vulgarisation agricoles. Minist. Colon., Direct. Gén. Agric. Élev., Bruxelles. Sér. A : Phytotec. Tract No. 10. 1 fr. Pp. 11.

(2) VANDENPUT, R. 633.513

Le kapok. (**Kapok**).

Propagande et colonisation No. 17. Minist. Colon., Direct. Gén. Agric. Élev. Colon., Bruxelles. 1 fr. Pp. 16.

(3) ANONYMOUS. 633.853.55

Le ricin. (**The castor oil plant**).

Propagande et vulgarisation agricoles. Minist. Colon., Direct. Gén. Agric. Élev., Bruxelles. Sér. A : Phytotec. Tract No. 2. 1 fr. Pp. 32.

(4) ANONYMOUS. 632.951.1

Le pyrèthre—culture et utilisation. (**Pyrethrum cultivation and use**).

Propagande et vulgarisation agricoles. Minist. Colon., Direct. Gén. Agric. Élev., Bruxelles. Sér. A : Phytotec. Tract No. 1. 1 fr. Pp. 16.

The first of these pamphlets on crop cultivation and development deals with the ginger

plant with notes on its history, botany, origin, varieties, soil requirements, preparation of the commercial product, uses, etc.
The second pamphlet deals on the same lines with the development of kapok production and the third with the castor oil plant including the pests and diseases to which it is subject, economic requirements and the value of the oil.
The different species and countries from which pyrethrin is obtained are noted in the fourth pamphlet with information on soil, climate, cultivation (with special reference to the Belgian Congo), drying, chemical composition and assay, action on various organisms, uses, and commercial pyrethrum products.

GARDNER, V. R.,
BRADFORD, F. C. and
HOOKER, H. D. (jun.). 634
**The fundamentals of fruit production.**
McGraw-Hill Publishing Company, Ltd., London 1939 : 2nd ed. 33s. 0d.
Pp. xvi + 788. 76 figs. 24 tables.

The second edition of this book (the first edition of which appeared in 1922) has been brought up to date and considerably enlarged, and it should be widely welcomed as a useful addition to the literature. It is *not* a manual of empirical facts relating to the production of fruit crops; instead the method adopted is to review the relevant facts of plant physiology which underlie particular agricultural operations and so to lead up to a sound understanding of the whys and wherefores of those operations. This, in the opinion of the reviewer, is the best form of textbook on a subject such as this, since it should lead to a much greater amount of adaptability and ability to respond intelligently to those periodical wholesale changes of crop or method which economic factors so often impose on the grower.
The book is divided into seven sections; Water relations, Nutrition, Temperature Relations of Fruit Plants, Pruning, Fruit Setting, Propagation, and Geographic Influences in Fruit Production.
Certain parts of the book will be of considerable interest to the breeder, e.g. the discussion of the factors underlying resistance to drought and winter injury and also the sections on fruit setting, stock-scion relationships and geographical distribution.
The standard of production of the book is excellent.

634.97(41)
634.97(410 + 41.7)
**A handbook of home-grown timbers. (Second edition).**
His Majesty's Stationery Office, London 1939 : 2s. 0d. Pp. vi + 87.

COX, H. A. (Editor).
**A handbook of Empire timbers.**
His Majesty's Stationery Office, London 1939 : 3s. 6d. Pp. vii + 214.

The first of these volumes, which was first published in 1936, has now been brought out in a second edition to conform with the second volume, the new "Handbook of Empire Timbers". It has been much amplified, data on a number of new trees being added as well as an extensive treatment of the strength properties of the major timbers which serves as a useful guide to utilization.
The data now given (wherever they are available) in these two volumes on the trees of the British Empire and the home country are (1) size of the tree, (2) general description of the timber, including specific gravity before and after seasoning, (3) seasoning properties and degree of shrinkage during drying, (4) wood bending and other mechanical properties, (5) durability, (6) susceptibility to insect attack, (7) type of preservative treatment necessary, (8) working qualities, (9) uses and (10) supplies. The various strength properties (maximum bending strength, stiffness, resistance to indentation, splitting, etc.) are tabulated in an appendix.

WALKER, J. C. 635–2
**Diseases of vegetable crops.**
Edwards Brothers, Inc., Ann Arbor, Michigan 1939 : $1.75. Pp. 67. (Planographed typescript).

This is the second edition of a book first published in 1935. It is essentially an outline designed for reference purposes in connexion with an advanced course in plant pathology, but it will also be very useful for the research or advisory worker. The method adopted is to arrange the important American vegetable crops according to host groups and for each crop to describe briefly the major diseases and to list many of the minor ones. In the case of important diseases the following data are given: host range, history, distribution, economic importance, symptoms, name, major characteristics and life history of causal organism, course of infection, varietal resistance and control. There are also selected bibliographical references. The book is written in note form with the utmost brevity, but the bibliographies make it a most useful key to more detailed treatments.

## NEW JOURNALS

**Palestras Agronómicas.**

The first volume of a Portuguese journal Palestras Agronómicas (Agronomic Forum) has recently been received; published in 1939, volume I is variously referred to as 1938 and 1937; it comprises articles on a number of subjects connected with agriculture, based on discussions held at the Estação Agronómica Nacional in 1938. Of the five articles appearing in the first volume plant breeders will be most interested in that by Pires on "Breeding methods at Svalöf and Cambridge" referred to in Abst. 316 above.
(Published by Estação Agronómica Nacional, Lisbon).

**The Advancement of Science.**

The Report of the British Association, which has appeared without intermission as an annual volume from 1831 to 1938 is now to be published quarterly under the title of "The Advancement of Science", each volume consisting of four parts. The reason for this change is the widespread feeling that many people who wanted merely a small section of one of the reports would not be prepared to buy a lengthy annual volume for the sake of a few pages, the result being that the report became to some extent a place for the "premature burial of scientific communications".

In its new form the Report is published on thicker paper and with a larger page size than before and the general make-up is a great deal more attractive. The success of the new scheme will to some extent be determined by the grouping of the contents of the various numbers; reports of papers on allied subjects should clearly be placed as far as possible in the same number, since they will appeal to the same reading public. In the first issue in the new form this seems to have been done quite well, the sections covered being Zoology, Anthropology and Botany in addition to the presidential address by Sir Albert Seward, which of course was on a paleobotanical subject. In the second number the grouping is not quite so clear but it remains to be seen (when the third and fourth numbers are forthcoming) whether anything better could have been done.

The customary "scientific survey" of the district where the meeting was held is being published in instalments, part appearing in each of the first three quarters -an arrangement which is surely a negation of the original object of quarterly publication. [Published by the British Association for the Advancement of Science, Burlington House, London, W.1. The Advancement of Science constitutes the Reports of the Association. To non-members, and to members not entitled to receive it under the terms of their subscriptions, the price is 5s. per quarterly part, or 15s. per year (four parts) payable in advance].

# INDEX


Abbe, E. C., 434
Ali Mohammad, 304
Almeida, J. M. de, 385
Andres, J. Ma., 426
Angeli, G., 332
Anonymous, 270, 273, 286, 295–6, 298, 300, 306, 308, 327–8, 335, 355, 502–3, 522–4, 526, p. 152, p. 153, p. 154.
Armstrong, G. M., 368
Atwood, S. S., 470
Avanzi, E., 456
Avery, G. S. (jun.), 331
Ayyangar, G. N. Rangaswami, see Rangaswami Ayyangar, G. N.
Azzaroli, F., 558

Baker, K. F., 547
Barbee, O. E., 445
Bartolucci, A., 509
Beadle, G. W., 329
Beecher, F. S., 574
Berezina, N., 515
Bjaanes, M., 364
Björling, K., 482
Blakeslee, A. F., 508
Bleier, H., 342
Blin, H., 559
Boerger, A., 383
Bowden, W. M., 363
Bowers, F. A. I., 505
Bradford, F. C., p. 154
Brandes, E. W., 502
Briggs, F. N., 279
Brink, R. A., 468, 510
Brown, H. B., 487
Brown, W. L., 458
Builin, D. P., 405
Builina, E. S., 405
Bujanov, Ju. M., 410
Bukasov, S. M., 475
Burbank, L., p. 151
Burnham, C. R., 437
Busch, N. A., p. 152

Câmara, A., 341, 397
Capinpin, J. M., 429
Cartledge, J. L., 437
Carvalho, A., 511–2
Česnokov, P. G., 409
Chi Pao Yu, 290–1
Chiappelli, R., 448
Ciferri, R., 373, 401
Clark, F. J., 433
Clark, J. A., 382
Collins, J. L., 547
Comrie, A. A. D., 280
Cooper, D. C., 466, 468, 510
Corsan, G. H., 539
Coutinho, L. A., 397
Cox, H. A., p. 154
Creighton, H. B., 331
Crist, J. W., 536
Cugnac, A. de, 463
Curteis, W. M., 272

Dahl, A. O., 361
Daniel, L., 577
Darlington, C. D., 268
Davidson, W. D., 285
Delwiche, E. T., 579
Dimock, A. W., 365
Doná dalle Rose, A., 519
Doolittle, S. P., 574
Doutreligne, J., 336
Drewes, H., 566
Dudok van Heel, J. P., 315
Dusseau, A., 506

Einset, J., 434
Ekstrand, H., 575
Elsocht, P., 514
Engledow, F. L., 288
Enken, V. B., 578
Ermakov, A. I., 517
Evans, H., 294
Evreinoff, V. A., 535, 545

Fabergé, A. C., 267
Fallon, F., p. 153
Faria, C. V. de Oliveira, 488
Favorsky, M. V., 350
Fernando, M., 259
Fetisov, see Fetissov
Fetissov, A. I., 421
Franzke, C. J., 461
Frimmel, F., 420

Gardner, V. R., p. 154
Garrido, T. G., 500–1
Gates, R. R., 260
Gavaudan, N., 353, 356
Gavaudan, P., 353, 356
Generalov, G. F., 581
Gerasimova, see Gerassimova
Gerassimova, H., 354
Germek, E., 452
Giglioli, R. G., 373, 401
Gilev, M. I., 518
Gisquet, P., 506
Glinjany, see Glinyany
Glinyany, N. P., 360
Glotov, V., 357
Goidànich, G., 558
Goldhausen, M., 572
Gorlač, A. A., 407
Graves, A. H., 556
Gregory, W. C., 344
Griesinger, R., 472
Groenewolt, J. K., 372
Guard, A. T., 406
Gusseva, A., 352

Haan, H. de, 371
Haertl, E. J., 345
Halcrow, M., 302
Hansford, C. G., 292
Hårdh, H., 568
Harrison, A. L., 369
Harvey, R. B., p. 153
Haupt, A. W., p. 151
Hayes, H. K., 414, 438
Heim, R., p. 152
Henderson, P., 583
Higgins, B. B., 543
Hill, H. D., 460
Hirama, S., 484
Hitier, H., 506
Hoed, F., 514
Hofmeyr, J. D. J., 309
Hooker, H. D. (jun.), p. 154
Hore, H. L., 277
Houtzagers, G., 555
Howard, H. W., 567
Hume, A. N., 461
Humphrey, L. M., 491
Husfeld, B., 548
Hutchinson, J. B., 289, 489–90

Ivanov, V. I., 476
Ivanovskaja, E. V., 478

Jack, H. W., 261
Jagger, I. C., 570
Jeffrey, E. C., 345
Jenkins, M. T., 424
Jensen, H. W., 337
Johnson, L. P. V., 310-1
Johnstone, F. E. (jun.), 477
Jones, H. A. 563

Kakhidze, N. T., 419
Kasahara, Y., 399
Katanskaja, G. A., 462
Khan, S., 283
Kibizov, V. P., 431
Kilany, M. A. El., 493, 499
Kiseleva, A. K., 375
Klinkowski, M., 472
Komarov, V. L., p. 152
Kondo, M., 399
Kopetz, L. M., 569
Košel'kova, N. N., 582
Kostoff, D., 338, 349, 351, 422
Kouba, T. F., 560
Kozubenko, V. E., 436
Kraevoi, S. Ja., 441
Krajevoj, see Kraevoi
Krayevoy, see Kraevoi
Krickl, M., 564
Krishna Menon, K., 303
Krug, C. A., 301, 511–2
Kuprijanov, S. I., 389
Kuwada, Y., 339
Kuzmin, A. Y., 544
Kuznetzov, P. V., 532

Langham, D. G., 430
Lanjouw, J., 504
L(eake), H. M., 269
Ledingham, G. F., 467
Levitsky, G. A., 396
Lind, E., 525
Lock, G. W., 293
Lomako, A. Z., 442
Longley, A. E., 432
Love, R. M., 394
Lubenez, P. A., 469
Luk'janjuk, V. I., 403
Lykov, T. G., 538
Lykova, P. I., 538

McClelland, C. K., 417
McEwen, J., 274
Mackay, E. L., 496
McUmber, R. R., 546
Makhnorylo, V. F., 318
Malinovskaja, E. S., 408
Mann, C. E. T., 307
Marčenko, I. I., 520
Marino, A. E., 427
Mather, K., 266
Matsumura, S., 386
Menabde, V. L., 395
Mendes, A. J. T., 301
Mendes, J. E. T., 511
Méneret, G., 317
Menon, K. Krishna, see Krishna Menon, K.
Mensinkai, S. W., 312
Meulen, J. G. J. van der, 450, 453
Meunissier, A., 528
Michels, C. A., 428
Mikhailovskii, V., 446
Miller, J. C., 486
Miller, W. B., 277
Mirzojan, A. I., 376, 384
Mohammad, A., see Ali Mohammad
Mohammad, N., see Noor Mohammad
Moore, M. B., 414
Moore, R. C., 530
Mori, H., 411
Murav'ev, P. A., 390
Myers, W. M., 459–60, 464

Nagao, S., 454, 494
Nakayama, K., 449
Navashin, M. S., 354
Neatby, K. W., 281
Nebel, B. R., 340, 358
Needham, J., p. 150
Nielsen, E. L., 457
Nilsson, F., 527
Nishiyama, I., 415
Noor Mohammad, 299
Norwood, J. W., 562

Olmo, H. P., 550
Osaka, S., 565
Ostendorf, F. W., 513
Oudot, G., 522

Pagel, W., p. 150
Pakhomova, V. P., 319
Palienko, V. I., 404
Panduranga Rao, V., 282
Panos, D. A., 323
Patchev, A. G., 537
Paul, W. R. C., 259
Piekarski, A., 481
Pierce, W. P., 471
Pires, D. R. V., 316
Pirovano, A., 326, 552–3
Pisarev, V. E., 408
Plotnikov, N. Ja., 377
Poddubnaja-Arnoldi, V. A., 396
Pojarkova, A. J., 534
Pokhil', I. F., 378
Ponnaiya, B. W. X., 284
Pope, M. N., 439
Poperekov, M., 495
Porte, W. S., 574
Postma, W. P., 497
Powers, L., 313, 330, 573
Pridham, J. T., 272
Prijamopol'skii, P. K., 320
Prjanišnikova, Z. D., 418
Propach, H., 557
Puhr, L. F., 461
Pustovoit, E. S., 379

Randolph, L. F., 434
Rangaswami Ayyangar, G. N., 284
Rao, V. Panduranga, see Panduranga Rao, V.
Reed, C. A., 540
Reinhold, J., 561
Rietsema, I., 529
Riker, A. J., 560
Rjazanov, K. D., 321
Rodrigues, A., 551
Roland, G., 334
Rollan, A. O., 429
Rosen, H. R., 417
Rubtsov, see Rubzow
Rubzow, G. A., 533
Ruttle, M. L., 358
Rybin, V. A., 498, 576
Rybin, W. A., see Rybin, V. A.
Ryker, T. C., 455

Sadik, H. G., 299
Sadovnikov, G. T., 443
Sakai, K., 451
Salaman, R. N., 287
Salamatov, M. N., 325
Saltykovskii, A. I., 412
Saltykovskii, M. I., 423
Saltykovsky, see Saltykovskii
Šalygin, see Shalygin
Sansome, E. R., 314
Sansome, F. W., 314
Saprygina, E. S., 423
Savitskii, M. S., 380
Sax, K., 333, 347
Scharaschidze, G. I., 395
Schrader, F., 343
Schreiner, E. J., 554
Schwanitz, 324
Sears, E. R., 388
Sebto, A. G., 518
Ségal, L., 549
Senn, H. A., 465
Šepeleva, see Shepeleva
Sergeev, V. Z., 381
Sessous, 516
Shalucha, B., 331
Shalygin, I. N., 440
Shank, D. B., 425
Shepeleva, E. M., 416
Shimamura, T., 359
Shmuck, A., 352
Silow, R. A., 490
Sims, H. J., 277
Singh, R. D., 283
Singleton, W. R., 433
Sinnott, E. W., 571
Sizova, M. A., 396, 398
Skovsted, A., 362
Skvortsov, S. N., 322
Sleesman, J. P., 483
Slugin, P. T., 580
Smirnova, M. I., 462
Smith, G., 541
Sorokin, K. A., 400
Soukup, V., 480
Stakman, E. C., 414
Stanton, T. R., 413
Starkov, A. A., 381
Stebbins, G. L. (jun.), 348
Stevens, W. L., 264
Stevenson, F. J., 473, 479
Stevenson, G. C., 294
Stockdale, F., 262
Stoffels, E. H. J., 521
Strampelli, N., 374
Sudnov, P. E., 389
Šul'ga, M. S., 402
Šulyndin, A. F., 393
Sutton, G. L., 274
Swanson, C. O., p. 153

Takano, T., 454
Takahashi, M., 505
Tavares, H., 492
Thomas, K. M., 303
Tichonova, A. S., 531
Tidd, J. S., 444
Tikhvinskaja, V. D., 507
Torres, J. P., 500
Tschermak-Seysenegg, E. von, 387
Turrill, W. B., 263
Tussing, E. B., 474
Tyler, L. J., 367

Uber, F. M., 435

Valadares, M., 341
Vandenput, R., p. 153
Vasconcellos, J. de Carvalho e, 447
Vears, C. K., 272
Vijayaraghavan, C., 282
Vijayasaradhy, M., 297
Villars, R., 346

Walker, G. W., 274
Walker, J. C., p. 155
Warmke, H. E., 508
Watanabe, K., 485
Waterhouse, W. L., 271, 274
Watkins, A. E., 275
Webster, C. C., 305
Weetman, L. M., 417
Weindling, R., 368
Wellman, F. L., 370
Welsh, J. N., 278
Wenholz, H., 272, 276
Wettstein, W. von, 557
Whaley, W. G., 571
Whitney, L. D., 505
Willis, J. C., 265
Wipf, L., 466
Wishart, J., p. 150
Wood, M. N., 542

Yamamoto, Y., 366

Žebrak, see Zhebrak
Zhebrak, A. R., 391–2
Zorin, F. M., 537

## THE IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,

**School of Agriculture, Cambridge, England.**

*Director*: PROF. F. L. ENGLEDOW, M.A., Drapers' Professor of Agriculture.

*Deputy Director* : P. S. HUDSON, Ph.D.

*Assistants* :

MRS. R. M. INGHAM, M.Sc. MISS M. L. C. WILSON, B.A. S. ELLERTON, Ph.D.

*Secretary* : MISS K. M. STEARN.

### Publications :

### PLANT BREEDING ABSTRACTS.

Issued quarterly. Subscription 25/-, with Subject Index 27/6. (Subscriptions sent direct from within the British Commonwealth of Nations are subject to a reduction of 5/-.) Single copies 7/6 each.

A few back numbers of Vol. V onwards are obtainable at 35/- per volume, single numbers 10/-. each.

Copies of "Plant Breeding Abstracts" printed on one side of the paper can be supplied, for the convenience of readers wishing to cut up and file the references, at an additional cost of 5/- per volume.

**Important Note.**—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Deputy Director copies of their papers immediately on publication.

### Other Publications :

| INDEXES | s. | d. |
|---|---|---|
| Subject Index to Vols I to V of Plant Breeding Abstracts | 2 | 6 |
| Subject Index to Vols VI to VIII of Plant Breeding Abstracts | 2 | 6 |
| Subject Index to Vol. IX of Plant Breeding Abstracts | 2 | 6 |
| **SUPPLEMENTS TO PLANT BREEDING ABSTRACTS** | | |
| Summary of Reports received from Countries exclusive of the British Empire, 1928-31. Supplement I. | 2 | 6 |
| Summary of Reports received from Stations in the British Empire, 1932-35. Supplement II | 2 | 6 |
| **TECHNICAL COMMUNICATIONS** | | |
| Vernalization and Phasic Development of Plants | 10 | 0 |
| An Outline of Cytological Technique for Plant Breeders | 1 | 6 |
| The South American Potatoes and their Breeding Value | 3 | 6 |
| The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe | 1 | 0 |
| Field Trials : their Lay-out and Statistical Analysis by John Wishart | 2 | 6 |
| Joint Publication No. 3. The Breeding of Herbage Plants in Scandinavia and Finland | 4 | 0 |

| BIBLIOGRAPHICAL MONOGRAPHS | s. | d. |
|---|---|---|
| Breeding Varieties Resistant to Disease | 2 | 0 |
| Breeding Resistant Varieties, 1930-33 (Supplement) | 2 | 0 |
| Oat Breeding Bibliography | 1 | 6 |
| Rice Breeding Bibliography | 1 | 6 |
| Bibliography on Interspecific and Intergeneric Hybridization in Relation to Plant Breeding | 2 | 0 |
| Account of Research in Progress in the British Empire | 3 | 6 |
| Rye Breeding Bibliography | 1 | 6 |
| Bibliography on Breeding Sorghums and Millets | 1 | 0 |
| The Experimental Production of Haploids and Polyploids | 2 | 6 |
| Tobacco Breeding Bibliography | 1 | 0 |
| Bibliography of Baking Quality Tests, Supplement | 1 | 6 |
| Bibliography on Cold Resistance | 1 | 6 |

Subscriptions to any of the above Publications should be sent to the Deputy Director, Imperial Bureau of Plant Breeding and Genetics, School of Agriculture, Cambridge, England.

*Loss in Transit.*—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

# IMPERIAL AGRICULTURAL BUREAUX

## IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,

**School of Agriculture,**

**Cambridge, England,**

covers current literature on the breeding, genetics, and cytology of economic plants, including forage crops, fruits, and forest trees, and relevant publications in allied fields, such as applied statistics, plant pathology and other sciences.

For publications see inside cover.

## IMPERIAL BUREAU OF PASTURES AND FORAGE CROPS,

**Aberystwyth, Great Britain,**

covers current literature on grassland and forage crop research, the botanical aspect of soil conservation and certain plant biological research.

Publications: Herbage Abstracts, 25/- per annum,* 7/- per quarter.
Herbage Reviews, 15/- per annum, 4/- per quarter.

## IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS,

**East Malling, Kent, England,**

covers current literature on horticulture, including fruit, vegetables, commercial flower production, the cultivation of tropical plantation crops and the storage and processing of horticultural products.

Publication : Horticultural Abstracts, 25/- per volume,* single copies 6/6.

## IMPERIAL FORESTRY BUREAU,

**39, Museum Road,**

**Oxford, England,**

covers current literature on all branches of forestry and issues a quarterly publication.

Publication : Forestry Abstracts, 25/- per annum,* single copies 7/6.

## IMPERIAL BUREAU OF SOIL SCIENCE,

**Rothamsted Experimental Station,**

**Harpenden, Herts.,**

covers current literature on soil science, and issues an abstracting journal six times yearly.

Publication : Soils and Fertilizers, 25/- per annum.*

* These prices are subject to a reduction of 5/- per volume to subscribers within the British Commonwealth sending their subscriptions direct to the Bureau. Details on application to its Deputy Director, to whom subscriptions to its Abstracts Journal should be sent. Certain Bureaux publish special editions of their abstracts journals printed on one side of the paper only, for use in card indexes.

PRINTED BY W. HEFFER & SONS LTD., CAMBRIDGE, ENGLAND